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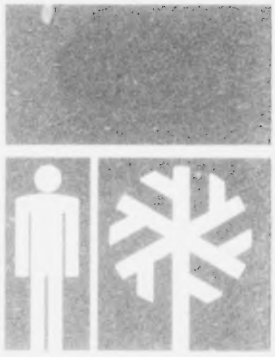

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UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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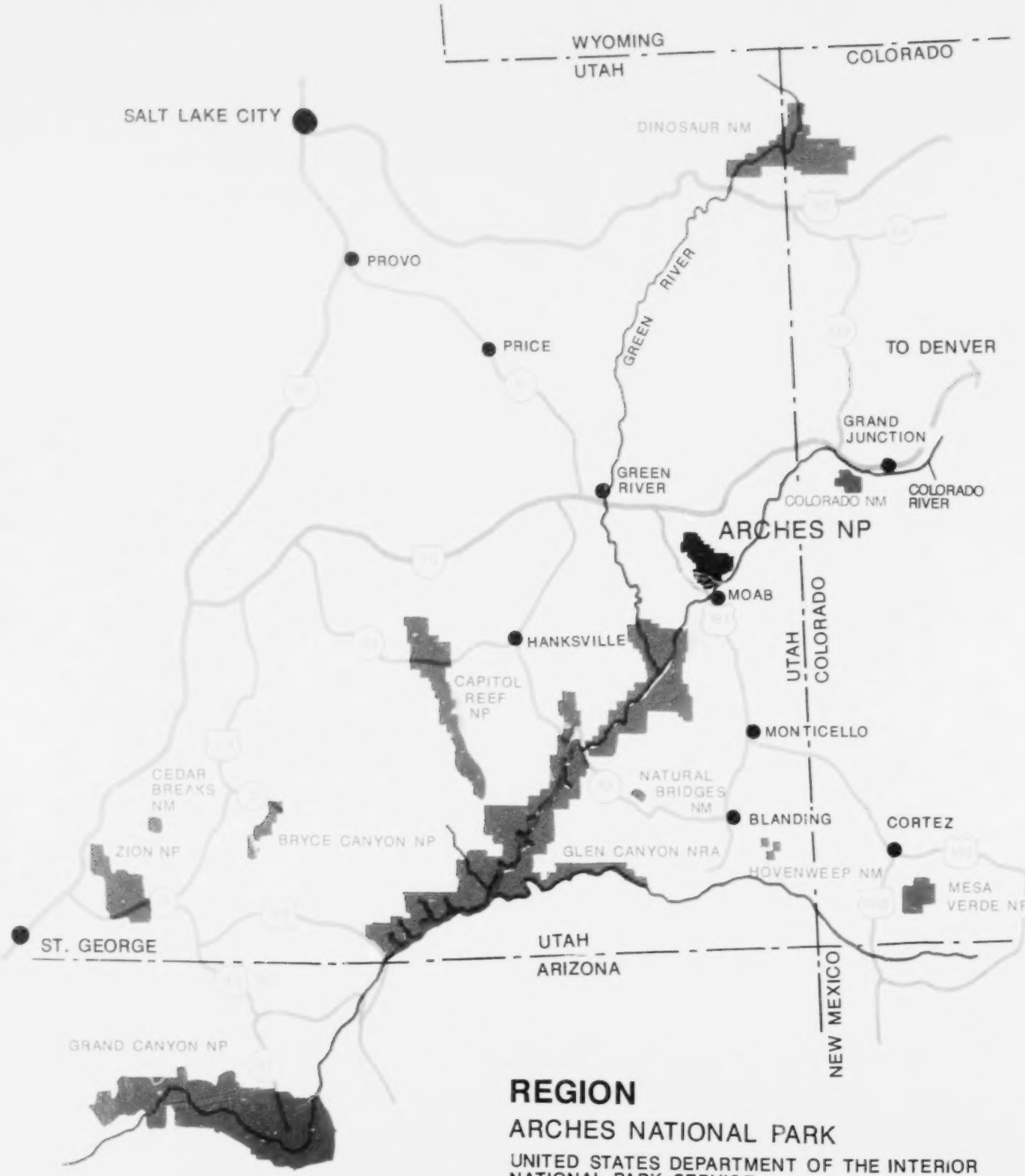

REGION

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

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INTRODUCTION

Arches National Park is in the high desert country of southeastern Utah, part of the Colorado Plateau. Lying entirely within Grand County, and north of Moab, Utah, the park contains 73,379 acres. Sandstone canyon walls, slickrock terraces, towering monoliths, and intricately eroded arches dominate the landscape. The park contains the greatest concentration of natural stone arches in the country, with examples of developing, complete, and collapsed arches all evident. There are nearly 900 openings in the park that would qualify as arches by most definitions. Landscape Arch is the largest, with a span of 306 feet and a height of 105 feet. Delicate Arch, balanced precariously on a precipitous ridge, is the most famous arch in the Southwest, if not the world. Distant landscapes extending well beyond the park boundary form a highly scenic background for the park's dramatically eroded sandstone features. Prehistoric rock art and historic remains of past ranching activity are listed on the National Register of Historic Places. Archeological sites represent at least three Indian cultures.

Arches was originally designated as a national monument of 4,520 acres, established by Presidential Proclamation 1875, on April 12, 1929. The purpose was to "protect extraordinary examples of wind erosion in the form of gigantic arches, natural bridges, 'windows,' spires, balanced rocks, and other unique wind-worn sandstone formations, the preservation of which is desirable because of their educational and scenic value."

The monument was enlarged to 29,160 acres by Presidential Proclamation 2312 on November 25, 1938, with additional wording changes to include protection of "prehistoric structures of historic and scientific interest." The boundary was adjusted again by Presidential Proclamation 3360, dated July 26, 1960, which added 480 acres in Salt Valley and deleted 720 acres north of the Windows. The proclamation stated that "it would be in the public interest to add to Arches certain contiguous lands on which outstanding geological features of great scientific interest are situated and certain other lands adjacent to the monument which are essential to the proper care, management, and protection of the objects of scientific interest situated on such lands and on lands now comprising a part of the monument." On January 21, 1969, Presidential Proclamation 3887 enlarged the monument by 48,943 acres to a total of 77,863 acres, extending the boundary to the Colorado River, including Dry Mesa and Cache Valley.

On November 12, 1971, an act of Congress (Public Law 92-155) changed the title of the area from national monument to national park. There was no language adding to the definitions of values to be preserved, except that "the National Park Service, under the direction of the Secretary, shall administer, protect, and develop the park subject to the provision of the Act entitled 'An Act to establish a National Park Service, and for other purposes,' approved August 25, 1916." A tract at Eagle Park at the north end of the park was added, and a tract of 9,559 acres, including Dry Mesa and most of Cache Valley, was deleted from the park, resulting in the current park boundary and area of 73,379 acres. The deleted portions are now administered by the Bureau of Land Management and the state of Utah.

TO SALT LAKE CITY
TO GRAND JUNCTION AND DENVER
GREEN RIVER
CRESCENT JUNCTION
ARCHES NATIONAL PARK
MOAB
MANTI-LA SAL NATIONAL FOREST
HANKSVILLE
CANYONLANDS NATIONAL PARK
DARK CANYON PRIMITIVE AREA (BLM)
MONTICELLO
MANTI-LA SAL NATIONAL FOREST
NATURAL BRIDGES NM
BLANDING
GLEN CANYON NATIONAL RECREATION AREA
GRAND GULCH PRIMITIVE AREA (BLM)
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RESOURCE MANAGEMENT AND PROTECTION

MANAGEMENT ZONING

For NPS management purposes the park will be divided into four zones – natural, cultural, development, and special use (see the Management Zones map).

The natural zone (65,914.62 acres) will be managed to conserve the natural resources and processes of the park while accommodating uses that do not adversely affect those resources and processes. Facilities in this zone will be dispersed and limited to those that have little effect on scenic quality and natural processes. Examples of facilities typical of the natural zone include foot trails, signs, and trailside information displays. Within the natural zone are two subzones – outstanding natural feature subzone and natural environment subzone. Geological features possessing unusual intrinsic value and uniqueness, such as Delicate Arch, Landscape Arch, and Balanced Rock, will be placed in an outstanding natural feature subzone, which will total 4,700 acres. The remainder of the natural zone (61,184.62 acres) will be managed as a natural environment subzone.

The historic zone (120 acres) will be managed to preserve, protect, and interpret cultural resources (both historic and prehistoric) and their settings.

The development zone will provide the necessary space for visitor and management facilities (71 acres) and roads (179.4 acres).

The special use zone (7,123.96 acres) will include those lands within park boundaries where uses are carried out by other government agencies or private interests. NPS control over the use of lands in this zone is either lacking or secondary to that of another party. The three subzones in this zone will be mining lease (40 acres), nonfederal lands (7,035.47 acres), and utilities (48.49 acres).

NATURAL RESOURCE MANAGEMENT

Protection and preservation of the natural environment to ensure ecosystem integrity while providing for visitor enjoyment will be the principal consideration of park managers. Programs for the study and protection of natural resources have been developed and assessed in the park's *Natural Resources Management Plan and Environmental Assessment*, which was revised and approved in 1986. Implementation is underway; however, additional funding will be needed for full implementation. Following is a brief description of the proposals from the approved resource plan. More detailed information can be found in the 1986 plan/environmental assessment.

The lack of adequate baseline information is a general resource management problem. Some resource components have never been studied, and little is known about others. Research projects will continue to upgrade understanding of natural resources in the park. Management of resource data is a growing concern as research becomes more specialized and data storage and retrieval needs increase. Upgrading of computer capability for data storage and processing will continue as new hardware and software are acquired.

Air quality monitoring efforts will be expanded to ensure baseline data in case of future degradation of this important park resource. At a minimum, particulate sampling and photography will be used to document air quality conditions. Effects on sensitive plant

species will be determined and monitored, along with effects on archeological resources. Interpretation will be increased to explain the importance of air quality to natural and recreational values. The National Park Service will review appropriate permit applications to determine possible air pollution impacts and to make recommendations to prevent or mitigate adverse impacts on park air quality. The National Park Service will continue to work closely with the Environmental Protection Agency and state of Utah to ensure development of emission control strategies needed to eliminate existing and prevent future visibility impairment at Arches.

Radiation (radon) monitoring has been conducted in the headquarters and housing area in the past, and monitoring will be continued in the future to assess the hazard from radioactive material.

Water resources include two wells for domestic water, backcountry springs and seeps, and two perennial streams. Backpackers depend on springs, some of which receive concentrated use. Monitoring of seven springs will continue to amass baseline data on water quality. Historic livestock-watering improvements will be allowed to deteriorate. Water rights will be secured to ensure park uses and resource values. The park's subsurface hydrology will be researched. A comprehensive water resource management plan will be prepared to guide and coordinate monitoring, research, and management related to a variety of water issues.

Trespass livestock continue to impact vegetation and springs in the park, even though livestock grazing was phased out of the park in 1982. Several springs, seeps, and streams have high coliform counts, probably due to trespass livestock. Sixteen miles of the park boundary will be fenced to protect park resources from trespass grazing. Monitoring and documentation of trespass livestock will continue.

Pronghorn antelope may have existed in the park area. Their occurrence and habitat requirements will be studied to determine if reintroduction would be appropriate. If so, the National Park Service will cooperate with the state of Utah to reintroduce pronghorn into the park.

Reintroduction of desert bighorn sheep is a long-term resource management goal that appears to have been successful in Arches. Monitoring of the herd will continue, and individuals will be transplanted if deemed necessary to prevent inbreeding.

Perpetuating the two endangered fish species in Colorado River tributary streams inside the park is a major fishery management concern. Only three species of fish occur in the park more than 1 mile from the Colorado River. Sport fishing is of little or no interest. Native and nonnative fish will be monitored to identify population numbers and trends and the need for mitigating measures to protect native species.

Relatively little is known about the rare, threatened, and endangered animal species in the park. Wildlife sightings are recorded, but data are collected on an opportunistic basis, instead of through long-term, systematic studies, and baseline information is generally lacking. Sensitive birds and mammals may be disturbed by some recreational activities. A systematic monitoring program will be designed and implemented, selected species will be studied, conflicts with man will be identified, and reintroduction programs may be implemented as part of the management of special status species.

A raptor study has been proposed for fiscal year 1989, and it appears funds will be made available. If funds are not allocated in 1989, a request will be made for funding a study in

MAPS

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the future. The scope of the research will include the habitat requirements, reproductive success, and human-caused disturbance of nesting raptors, including eagles, hawks, and owls.

Past wildfire suppression combined with livestock grazing has altered native plant communities, resulting in a reduction of perennial grasses and an increase of woody shrubs. The park's *Fire Management Plan* was approved in 1987. The important role of fire in the ecosystem will be restored by allowing natural fires to burn. All man-caused fires will be suppressed. Fire will be suppressed in zones surrounding developments and along the park boundary. Post-fire studies of vegetation plots will document long-term vegetation changes.

A number of nonnative plant species have invaded the park as a result of land disturbances caused by overgrazing and road construction, introduction as ornamental plantings, or volunteer spread. Some disturbed areas are succeeding to native vegetation following termination of livestock grazing. Selected sites will continue to be monitored using transects and photo points. Construction and maintenance will be planned and performed to reduce the perpetuation or introduction of exotic plant species. Certain species will be controlled at selected sites through cutting, burning, and use of approved herbicides, following the techniques of integrated pest management.

Outbreaks of insects and plant diseases have affected both native plants and ornamental trees in developed areas. In the past, insecticides have been applied to nonnative elm trees that provide shade in the headquarters areas. In the future, nonnative ornamental and shade trees that are subject to infestation will be phased out as part of the park's integrated pest management program.

The Arches region has a high incidence of endemic plant species because of harsh environmental conditions and geographic isolation. The survey of rare, threatened, and endangered plants will continue, and selected sites or habitats will be monitored.

A vegetation rehabilitation program will be continued to help reduce and mitigate previous disturbances. A parkwide study of impacted areas and revegetation needs will be conducted to aid restoration of native plant communities. Manipulative actions such as prescribed burning and seeding and transplanting native vegetation may be performed to accelerate restoration of natural vegetation on impacted sites. Research will be performed on blackbrush regeneration and revegetation of other native species.

A *Backcountry Management Plan* has been drafted to help ensure resource protection and a quality experience. The backcountry user permit system will be continued as a means of recording and dispersing use. Campsites and critical resource areas will be monitored to ensure resource protection. Use limits may become necessary in certain areas.

Management of landscapes and vegetation in developed areas will continue on several levels. Existing disturbed sites with nonnative vegetation or a paucity of vegetation due to trampling will continue to be treated and monitored by park staff. Site revegetation or restoration will be funded as part of construction project costs on major projects. The disturbed zones around construction sites will be kept to a minimum by careful design and project supervision. Revegetation of disturbed sites will include regrading, seeding with native plants, and follow-up treatments where necessary. At areas of concentrated use, pedestrians will be encouraged to stay on hardened paths. Cars will be contained on established roads and in parking areas by barriers such as curbs and gutters, guardrails, or rocks.

The special use permit for the natural gas pipeline allows annual inspection by vehicle, which may lead to disturbance of vegetation. Depending on vegetation and soil conditions, portions of the disturbed swath have revegetated, while other areas remain visible after more than 20 years since construction. It is proposed that the pipeline be rerouted outside the park when replacement or significant reconstruction is required.

WILDERNESS

A recommendation that 54,450 acres within the park be designated as wilderness was submitted to Congress May 23, 1977. These lands will be managed as wilderness until Congress acts. The recommendation also identified 9,050 acres as potential wilderness.

Construction of a Double Arch handicap-accessible trail (see "Site Development and Interpretive Media") will involve less than 1 acre of land included in the wilderness recommendation currently before Congress. The implementation of this proposal will be contingent on Congress excluding this land from the area currently recommended for wilderness.

If Lost Spring Canyon is added to the park, it will be considered for potential addition to wilderness.

CULTURAL RESOURCE MANAGEMENT

Significant cultural resources will be located, evaluated, preserved, protected, and interpreted in a manner that leaves them unimpaired for future generations. Programs for the identification and preservation of cultural resources are outlined in the *Cultural Resources Management Plan*, which was approved in late 1986. The status of cultural resource programs and current proposals are summarized below.

The first phase of a parkwide historic resource study and an updated list of classified structures was completed by Dr. Steven F. Mehls in 1986; this survey identified all historic resources (except archeological) and determined their significance.

Two properties are currently listed in the National Register: The Moab rock art panel (national significance) and the Wolfe Ranch Historic District (local significance). Four additional sites were included in a multiple-resource nomination in early 1987 and may be determined eligible for the National Register: the caretaker's residence, the Ringhoffer inscription near Klondike Bluffs, the Denis Julien inscription panel in the vicinity of Dark Angel Arch, and a segment of the Old Spanish Trail near the visitor center. Determinations of eligibility have been requested for nine additional sites (see the "Description of the Environment").

All properties in or potentially eligible for the National Register will be managed in accordance with *Cultural Resources Management Guidelines* (NPS-28), the National Historic Preservation Act (16 USC 470 *et seq.*), and Executive Order 11593, "Protection and Enhancement of the Cultural Environment" (*Federal Register* 36:8921). Properties recorded in the register will be given the highest priority for protection and will receive preservation maintenance. Other properties on the List of Classified Structures will have a lower priority for protection; however, no potentially historic property will be removed or destroyed without consultation with the Utah state historic preservation officer and the Advisory Council on Historic Preservation.

One of the major problems in planning is the lack of information. Baseline data about cultural resources, including geographic and geologic distribution, significance, and threats to sites, is needed to determine future management actions. The following inventories are required:

an inventory and catalog of the museum collection

an inventory and catalog of the archival library

an inventory and classification of items in the various park collections, such as photographs, slides, archeological materials, plant materials, and study specimens

a parkwide inventory and catalog of old roadways and dugways and an assessment of their historical and archeological significance

a historic resources base map

a complete parkwide archeological survey that includes rock art sites

Studies and guides that are still needed include

a cultural resources maintenance guide

a scope of collections statement and collections management plan

determinations of significance for archeological resources

historic structure reports and historic preservation guides for the Wolfe ranch, the caretaker's residence, and any other buildings or sites determined to be significant

historic preservation guides for these significant properties

an administrative history of the park

photographs and scale drawings of the park's pictographs and petroglyphs

In addition to the approved cultural resource program, described above, the following actions are proposed for incorporation into the park's *Cultural Resources Management Plan.* To reduce the impacts of visitor use and the potential for vandalism, on-site patrols and interpretation by rangers will be increased at the Moab rock art panel and Wolfe ranch; public programs will be provided to advise visitors about the value and protection of these resources; and archeological resources will be monitored to detect vandalism, illegal collection, and other deterioration. Low metal barriers and interpretive exhibits will be installed to help protect the Moab rock art panel, which has been vandalized twice in the last ten years, and the Ute petroglyphs near the Wolfe ranch.

Action will be taken to prevent deterioration of the structures in the Wolfe Ranch Historic District. However, the Wolfe cabin and root cellar are in the 100-year floodplain, and it is infeasible to floodproof these historic structures. Relocation is also infeasible because it would radically alter the historic setting.

If Lost Spring Canyon was added to the park at some future date, the National Park Service would be responsible for future protection and treatment of the Cordova cabin and

ranch and also several archeological sites in the canyon. These latter sites are prehistoric and include several dry-cave or alcove sites. The crumbling state of the Cordova cabin makes it more a subject of archeology than of history. It has been nominated to the National Register, but the determination of its eligibility has not yet been completed. In addition, a survey would be conducted to determine any additional cultural resources.

Adequate protection is required for the park's museum collection as well as for the archival library. The residence now used to store these collections would probably be damaged in certain instances of 500-year flooding. As shown on the site plan map for the headquarters area, a new building outside the probable maximum floodplain will be built for the display-quality items in the museum collection. The collection storage building will be fitted with the necessary protection devices. Certain items in the park collections will be shipped to the Western Archeological and Conservation Center in Tucson, Arizona.

LAND PROTECTION

A *Land Protection Plan* was written and approved in 1985, identifying management actions needed to protect nonfederal lands within the park boundary. Of the 73,379 acres of land within the boundary, all is federally owned except 6,902.44 acres of state-owned land, 320 acres with state-owned mineral rights, and 133.03 acres with a recreational patent held by Grand County. There are no privately owned lands within the park.

State land interests include surface interests and mineral rights. These lands are managed to produce maximum revenues to help support public schools. There are grazing permits and one oil and gas lease on some of the parcels. Although the permits and lease are not currently active, the potential for use exists. Fee acquisition of the state lands and interests is necessary to meet the park purposes of protecting the values of potential wilderness and preventing development and uses that would impair scenic and other resource values. The National Park Service is concerned that seismic exploration or drilling for hydrocarbons could damage significant park features. Another concern is the potential for visual intrusions. It is recommended that these tracts be acquired through a state-federal land exchange under existing procedures for implementing the Federal Land Policy and Management Act (43 USC 1714 et seq.). Once the tracts are acquired, action will be taken to phase out state oil and gas leases and grazing permits for the purpose of resource protection. Some of the federal land needed for exchange may be available from the Bureau of Land Management. The bureau has made an isolated tract of approximately 2,240 acres (3.5 sections) available for disposal. This tract is along the park boundary, west of Herdina Park, and the National Park Service has requested that it be kept available for a state-federal land exchange. The isolated BLM tract has oil and gas leases and, if transferred to the state, would continue to be managed for oil and gas extraction.

No action is recommended for the 133-acre Grand County tract as long as use complies with stipulations of the original patent. The county acquired a patent to the tract, which is along the Colorado River just north of the US 191 bridge, in 1961 under the Recreation and Public Purposes Act, prior to the tract's addition to the park in 1969. Existing uses that are allowed by stipulations of the patent are boat launching and docking, car parking, camping, picnicking, and storage. In 1985 Grand County requested that the patent be amended to allow addition of a restaurant, lodge, and convention facility. Most of the development would require tunneling into the canyon wall, with some of the facilities to be located near the top of the cliff. Rock removed from excavation would be placed in the floodplain to raise the area for parking. The National Park Service now administers the patent but does not have authority to amend it. Furthermore, the National Park Service is

concerned that development of the tract beyond uses already permitted would adversely affect the resources the park was established to protect. The tract is partially within the 100-year floodplain of the Colorado River, within 1 mile of habitat used by endangered bald eagles and peregrine falcons, and it is a highly visible section of the canyon scene.

The Northwest Pipeline Corporation has a special use permit (SP 1340-8-0001) for a 26-inch natural gas pipeline right-of-way some 6.8 miles long across the park. The right-of-way is 50 feet wide. The existing permit expires on December 31, 1989, and allows for annual inspection and maintenance. This permit was written with a provision that if the line is ever replaced, it will be rerouted outside the park.

A federal potash lease (U-067454) overlaps 40 acres of park land along the southwest boundary. The Bureau of Land Management is taking action to cancel the lease, and it is not expected to raise any future management issues for the National Park Service.

No valid mining claims exist within the park. All federal oil and gas leases within the park have expired.

Use of park roads by federal mineral lessees to access lands outside Arches may be permitted under "Commercial Vehicle" regulations (36 CFR 5.6(c)) *only* if no other access to these lands is available and providing the lessees use existing park roads.

PARK BOUNDARY ADJUSTMENTS

The National Park Service will recommend to the secretary of the interior and Congress that the park boundary along the 3-1/2 mile section of US 191 in Moab Canyon be realigned to follow the north boundary of the Utah Department of Transportation (UDOT) right-of-way. This would be consistent with the original intent of Congress to use the highway right-of-way as the south park boundary. An alternative to the boundary uniformly following the right-of-way would be to follow the top or bottom of cut-and-fill slopes in cases where this distance is within the right-of-way and to otherwise follow the uniform UDOT right-of-way on flat terrain.

At least one piece of park land within the existing boundary is south of the right-of-way, and several more parcels are within the highway right-of-way. These parcels would be transferred to the Bureau of Land Management and then relinquished by that agency to the Utah Department of Transportation. Five non-NPS tracts between the existing boundary and the highway would be added to the park boundary and acquired by the National Park Service. Existing use of the northernmost parcel for herding livestock would be permitted to continue after its transfer from Bureau of Land Management to National Park Service management. Existing abandoned roadway sections inside the park would be removed, regraded, and revegetated.

In compliance with Executive Order 12630, "Government Actions and Interference with Constitutionally Protected Property Rights," a takings implication assessment may need to be prepared. Department of the Interior implementing regulations are under preparation.

The National Park Service supports potential congressional action designating the Lost Spring Canyon wilderness study area as BLM wilderness. However, if the study area is deleted from wilderness consideration and returned to multiple use management, the National Park Service proposes that 2,882 acres be added to Arches National Park. The addition would follow the NPS recommendation in the *Resource Assessment for Lost Spring*

Canyon Wilderness Study Area (NPS 1984) and utilize topographic features such as cliff rims for boundaries. A portion of one section owned by the state of Utah would be within the addition. The addition would complement the park resource base, provide excellent outdoor recreation opportunities, and extend protection to cultural and natural resources. Livestock grazing would no longer be permitted on any land added to Arches National Park. Existing grazing amounts to approximately 150 animal-unit-months (BLM estimate for the Lost Spring wilderness study area).

ADJACENT LANDS

Threats to park values from sources beyond the park boundary are becoming more numerous with increasing regional development. Park resources and visitor enjoyment are vulnerable to impairment by pollutants, visual intrusions, odors, noise, and other impacts associated with mineral extraction, land development, utility line construction, operation of distant power plants, and aircraft overflights.

It is the policy of the Department of the Interior and the National Park Service to take the initiative to work cooperatively with others to anticipate, avoid, and resolve potential threats. Such management requires long-range strategic planning, accurate scientific data, a sensitivity to cross-boundary effects of management decisions, and a commitment to cooperate in the identification and implementation of regionally coordinated management strategies. The National Park Service will continue to consult with other agencies in their land use planning and will continue to review environmental documents related to regional land use proposals. The primary purpose of these activities will be to provide information about potential impacts on park resources and visitor enjoyment and to identify actions that could be taken to avoid impairment of park values. All agencies or parties proposing activities that could potentially impair park values will be encouraged to involve the Park Service as early as possible in planning for that activity to ensure adequate evaluation and mitigation of impacts. Adequate baseline information and monitoring data about long-term trends and unusual changes will be essential to establishing the facts of the issues and finding effective solutions. This information will be developed as part of the park's resource management program.

The area of National Park Service concern extends to lands adjacent to the park containing resources that are critical to the health of park ecosystems or that contribute significantly to visitor enjoyment. Such resources include, but are not limited to, landscapes visible from park viewpoints, roads, and backcountry areas; portions of park watersheds that extend beyond the boundary; migration routes or habitat utilized by park wildlife; and archeological or historic sites or districts that are closely related to sites within the park. Adjacent public lands with resources integral to park values should be considered for special designation or management, such as the Bureau of Land Management's specially designated areas of critical environmental concern. A 1987 memorandum of understanding between the NationalPark Service and the Bureau of Land Management commits both agencies to early identification of potential conflicts so that they may be avoided or resolved.

The National Park Service is particularly concerned about the potential development of existing oil and gas leases on Dry Mesa, in Cache Valley, and on other BLM lands visible from park roads, viewpoints, and backcountry areas. The Park Service will consult with the Bureau of Land Management on any proposal related to existing oil and gas leases to help ensure nonimpairment of park values. It is recommended that existing leases be reviewed for potential inclusion of stipulations designed to avoid impairment of park values, and that areas visible from park roads, viewpoints, and backcountry areas be subject to standards

LOST SPRING AREA

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of surface occupancy or excepted from surface occupancy in future leasing or lease renewals. The superintendent will investigate the possibility of entering into a cooperative agreement, memorandum of understanding, or other means of implementing this recommendation.

VISITOR USE

INFORMATION/ORIENTATION/INTERPRETATION

The *Interpretive Prospectus* for Arches, approved in 1979, has been partly implemented, but some portions of the document no longer meet visitor and management needs. The current annual statement for interpretation more realistically identifies the following parkwide interpretive themes:

> Geology: Erosion continually shapes the landscape into a spectacular array of arches, spires, fins, and balanced rocks.
>
> Plant and Animal Adaptations: Survival of life on this high desert plateau is a process of adaptation to extremes.
>
> Archeology: Preserving archeological resources is a vital first step toward understanding and saving our past for future generations.
>
> Human History: Mining and ranching in Arches are historically significant and have an effect on the natural landscape.
>
> Safety: Trip preparation and awareness of potential hazards are critical to safe and enjoyable frontcountry and primitive backcountry travel.

A variety of approaches will be used to present these themes and to interrelate them in an effective impression of the Arches landscape. A new visitor center will be constructed at the headquarters area. The center will provide the beginning point where visitors will receive information and orientation about the park and enough interpretation to stimulate an interest in exploring the park and its features. The level of interpretation will be just enough to motivate visitors to enter the park and see the resources for themselves.

A new series of wayside exhibits will provide on-site interpretation of specific features, placing them in the context of the themes described above. Each exhibit will stand on its own, while contributing to an overall understanding of the dynamic processes that have shaped and continue to shape the park. A site-by-site analysis was undertaken as part of this plan to identify the best places to demonstrate the various facets of the park's natural and cultural history. The proposed topics for interpretation at each site are described under "Site Development and Interpretive Media." A wayside exhibit plan will be prepared to guide the specific contents of the exhibits (see "Future Plans and Studies"). Existing waysides will be evaluated for their effectiveness and how well they fit into the plan, and those that are not relevant will be removed.

The road guide will be updated as soon as possible for use until the wayside exhibits can be installed along the main road. Eventually the road guide will supplement the wayside exhibits, giving visitors more in-depth information and providing an inexpensive souvenir.

A hiker's guide with maps and descriptions of trails and cross-country routes will also be prepared. Discussions of appropriate safety measures for desert hiking and resource protection measures will be integrated throughout the guide.

RECREATIONAL ACTIVITIES

Recreational activities will include sightseeing (vehicle tours), interpretive activities, hiking, backpacking, camping, bicycle touring, mountain biking, horseback riding, and four-wheel driving. The park will be divided into experience zones (see the Visitor Experience Zones map), within which certain kinds of activities and experiences will predominate. Specific zoning for backcountry hiking, backpacking, and horse use is provided in the *Backcountry Management Plan*.

Frontcountry Sightseeing

The highest percentage of total park visitors (95%) will exclusively use this zone, where they can easily and quickly see many of the park's outstanding features by way of paved roads and short, well-defined trails. Throughout this zone, use will be encouraged and accommodated by facilities such as a visitor center, a campground, restrooms, picnic areas, and handicap-accessible trails. There will be interpretive publications available at the visitor center, on-site exhibits at the major natural and cultural features, interpretive programs at the campground, and guided interpretive activities. A moderate to high frequency of encounters with others will give visitors the perception of a low degree of self-reliance. Despite the high frequency of encounters, there will be occasional opportunities for solitude.

The main park road and all of its pulloffs, and the spur roads to the Windows and the Delicate Arch viewpoint, will be included in this zone. The Windows will continue to be the primary destination of at least 40 percent of all park visitors – those who spend a half day (four hours) or less in the park. The site is particularly popular because there are many arches in a relatively small area, and they are highly visible and readily accessible by trail. Building on these assets, the Windows will be enhanced as a major day use activity area for all visitors, including the handicapped.

Visitors who plan to spend one or more full days in the park will travel more widely throughout this zone. An estimated 23 percent of visitors currently travel to the end of the paved road at Devils Garden. Although fewer visitors might use the northern half of this zone, the experience will not be significantly different from that in the southern half.

The road to the Delicate Arch viewpoint will be paved to facilitate access to that outstanding feature. Paving the road will change the visitor experience from one of driving on a gravel road with some risk to a continuation of the main road driving experience. The amount of traffic on the road and the number of people at the trailheads and on the trails will probably increase. Although paving the road will facilitate access and make it possible for more people to see the arch, it might detract from some visitors' enjoyment.

Backcountry, Motorized Recreation

About 2 percent of total park visitors will use this zone. Features will be accessible by primitive roads suitable for high-clearance or four-wheel-drive vehicles and mountain bikes and by marked hiking routes or cross-country travel. There will be no facilities and little, if any, on-site interpretation. A low frequency of encounters with others will give visitors the perception of a moderate degree of self-reliance and reasonable opportunities for solitude. The Salt Valley road, the two four-wheel-drive roads, and the Klondike Bluffs area will be included in this zone.

Backcountry, Nonmotorized Recreation

About 5 percent of total park visitors will use this zone. Access will be by foot or horseback on primitive trails or by cross-country hiking. There will be no facilities and no on-site interpretation, and the emphasis will be on independent learning. Encounters with others will be infrequent or nonexistent, giving visitors the perception of a high degree of self-reliance and the greatest opportunity for solitude.

CONCESSION ACTIVITIES

Authorized concession services (guided tours by bus, van, jeep, horseback, and bicycle) are satisfactory and, in fact, are underutilized. Concession facilities do not appear to be necessary at this time. The nearby communities at Moab can provide merchandise sales, food and beverage service, and lodging.

CAPACITY

The demand for use of the park is expected to increase by 36 percent by the year 2005; however, sufficient data do not exist to determine whether or not this amount of use can be accommodated without causing unacceptable deterioration of natural or cultural resources or visitor experiences. To gather the necessary data for decisions on capacity, a Visitor Impact Management (VIM) program will be implemented. The program will use the National Parks and Conservation Association visitor impact management process (Graefe et al 1987), which calls for determination of standards for key impact indicators, comparison of these standards with existing field conditions, and determination of appropriate management strategies to deal with probable causes of impacts. The principle of visitor impact management has long been an integral part of NPS resource management practices. Thus, the VIM program will not introduce a new management concept, but it will provide a formalized framework for applying the concept to all aspects of visitor use. An outline of the VIM process (with an example of how the process can be applied to a specific area within Arches), a list of potential impact indicators, and a discussion of how the program will be implemented are included in appendix A.

The capacity of facilities, in particular parking, throughout the park road corridor controls much of the use in front- and backcountry dispersed use areas. Concurrently with the implementation of the VIM program, parking and other trailhead facilities at Devils Garden, the Wolfe ranch, and the Delicate Arch viewpoint will be expanded to accommodate the existing demand (estimated 1989 summer weekend demand). Providing larger and more structured parking areas will be accompanied by the elimination of roadside overflow parking, and the net effect is expected to be an improvement, rather than a deterioration, in resource conditions and visitor experiences. Even though the parking areas will be larger and more structured with the addition of barriers, these changes will probably not have a major impact on visitor experiences because the number of cars and the number of people on the trails will remain about the same.

At Balanced Rock, parking will be expanded as much as possible on the existing site, but the additional parking needed to accommodate the existing demand at that location could not be provided without developing an entirely new access road and parking, and there is a strong concern that unacceptable resource deterioration would result from such development. Once the VIM program is implemented, it will be determined with certainty whether or not visitor facilities can be expanded further at Balanced Rock.

Table 1 lists the maximum parking capacities that will exist in the road corridor once the proposed parking improvements are implemented. From these capacities, the theoretical maximum number of persons at one time (PAOT) was calculated by multiplying the average number of persons per car (3.4) times the number of parking spaces. The theoretical daily capacity of persons was derived by totaling the PAOT and multiplying that by a turnover rate of 3 (based on a nine-hour use day with an average length of stay of three hours). Site-specific turnover rates were not used to calculate daily capacity because in many cases the length of stay is only 5 or 10 minutes or visitors do not stop at all; thus, the results would be grossly inflated and of little value.

Table 1: Road Corridor Parking Capacity, Proposal

Sites serving frontcountry[1]	Vehicle Spaces	Theoretical Max. Persons at One Time	Theoretical Daily Capacity
Visitor center	59	200	
Moab Fault	5	17	
Park Avenue	33	112	
Courthouse Towers	20	68	
Balanced Rock	16	54	
Garden of Eden	10	34	
Windows	64	218	
Panorama Point	55	187	
Delicate Arch Viewpoint	28	95	
Subtotals	**290**	**985**	**2,955**
Sites serving backcountry[2]			
La Sal Mountain Viewpoint	28	95	
Wolfe Ranch/Delicate Arch trailhead	44	150	
Fiery Furnace	15	51	
Sand Dune Arch	18	61	
Devils Garden	58	197	
Broken Arch trailhead	8	27	
Klondike Bluffs	8	27	
Subtotals	**179**	**608**	**1,824**
Totals	**469**	**1,593**	**4,779**

[1]Length of stay is less than 45 minutes. Primarily viewpoints with trails less than 1 mile.
[2]Length of stay is greater than 45 minutes. Trailheads for trails longer than 1 mile, incidental viewpoints.

Based on the breakdown between backcountry trailheads and frontcountry viewpoints, as shown in the table, about 40 percent of the daily visitor use occurs in the backcountry and 60 percent occurs in the frontcountry. The theoretical maximum capacities assume equal distribution of use and full use of all parking. Actual use figures indicate that this is currently not the case and that in a few instances there are radical differences. Some sites, notably Panorama Point, have capacities far in excess of actual use, while sites like Balanced Rock cannot accommodate half the existing demand. Today the people who cannot find parking at the most popular destinations generally are not dispersing to sites with excess capacity. Thus, the theoretical maximum capacities are exaggerated and will remain unrealistically high if existing use patterns continue.

Until the VIM program is operational, increases in use will be accommodated only to the extent that excess demand can be redistributed to currently underutilized areas. For

example, overcrowding at the Fiery Furnace area will be alleviated by spreading use more evenly over the day (by offering four guided tours per day instead of one) and by initiating similar tours of the Courthouse Canyon area (which is currently underutilized).

As stated above, visitor projections indicate a potential increase in visitation of 36 percent by 2005. Peak period daily use averaged 2,600 people per day in 1987. Using the projection figure of 36 percent, peak period daily use could be expected to average 3,536 by 2005. If use patterns changed and visitors were evenly dispersed throughout the park, this daily average visitation could be accommodated by the parking proposed in the general management plan. If, however, existing use patterns do not change and visitors continue to place increasing demands on a few popular sites, the parking proposed in this plan will not adequately meet the near-future demand for those sites. Recent visitation statistics indicate that use is increasing more rapidly than originally projected. The 36 percent projected increase for the year 2005 equates to 637,725 visits. Visitation in 1988 was 520,455 visits, which was an increase of 50,500 visits over the previous year. If this trend continued, visitation would reach the original projection for 2005 in the year 1991. Visitation has been increasing at an average rate of 11 percent for the past five years. Thus, it is imperative that the VIM program be given the highest priority.

Further expansion of roads, parking, and other facilities beyond the proposals of this plan will occur only if it is determined through the VIM program that additional visitors can be accommodated without causing unacceptable deterioration of natural or cultural resources or visitor experiences. A minimum of two years of data will be necessary to make such determinations. VIM must be initiated no later than the first year that use exceeds the year 2005 visitation projection in this plan.

Other focuses for the VIM program will be raptor nesting areas and the Colorado River shoreline. Nesting by raptors could potentially be disturbed by visitor use during the critical spring nesting season in the Klondike Bluffs area, along the Colorado River cliffs, and in other areas of the park. The population density and dynamics of these species and the effects of motorists, hikers, and boaters on nesting activity will be determined so that future management actions can be planned. Closely related research will be conducted to help determine the effects of public use on the 11-mile segment of the Colorado River paralleling the park boundary. The mouth of lower Salt Wash, an occasional boating stop, is outside the park but within 600 feet of the boundary. In addition to disturbance of nesting raptors, other concerns include the removal and burning of wood and improper disposal of human waste. Research will establish baseline conditions and sensitive habitats and determine types and levels of recreational use and impacts of current use.

HANDICAP-ACCESS

A cluster of handicap-accessible facilities will be developed at the Windows. Minor accessibility improvements, such as better signing, curb cuts, parking space striping, ramps, and restroom alterations, will be made throughout the park in the course of routine maintenance. Any new visitor or employee facilities and any alterations to existing facilities will comply with all appropriate laws and regulations, including the Architectural Barriers Act of 1968 (42 USC 4151 et seq.) and the Rehabilitation Act of 1973 (29 USC 792 et seq.). Where possible, facilities and interpretive programs will be available for the sensory and mentally handicapped, and information on the location of accessible facilities and opportunities will be available. The wayside exhibit plan and interpretive prospectus will address specific proposals for programs.

SITE DEVELOPMENT AND INTERPRETIVE MEDIA

PARKWIDE ROADS AND TRAILS

The width and standard of the main park road will remain the same. Parking pullouts along the road will be redesigned as necessary for safety. This will require some widening and lengthening of existing pullouts and possibly eliminating others (see the individual site development plans, below, and the "Road System Evaluation" in appendix B). Road signs will be evaluated and changes made as necessary, in accordance with a parkwide sign plan (see "Future Plans and Studies").

The Delicate Arch road will be paved to the end of the road, and bridges or culverts will be constructed across washes to facilitate access to the Wolfe ranch and the Delicate Arch viewpoint. The Salt Wash crossing is programmed for 1991, but the Winter Wash crossing still needs to be programmed. These actions will prevent road closures due to flooding and reduce maintenance. The existing alignment will be maintained as much as possible, and the road designed at a 25 mph standard, thereby minimizing cut and fill and retaining a quality driving experience.

The Salt Valley road and both four-wheel-drive roads will remain at their existing standards.

As now, the park will contain few designated trails. Stream washes and canyons, which provide many outstanding natural corridors for cross-country travel, will continue to be major means of backcountry access. Proposed trail improvements and new trails are described under the individual site development plans, below. Trail class standards are defined in appendix C.

The park staff will develop a parkwide plan for trail and road signs, establishing a standard format and design that will be compatible with the natural environment and consistent in appearance throughout the park. All signing will be visible but not overpowering to the site. Signs will be clustered in a pleasing and functional manner, and messages will be eye-catching, simple, and uncluttered. All regulatory, directional, and informational road signs will conform to standards in the *Manual of Uniform Traffic Control Devices* (MUTCD) as well as to NPS policies, guidelines, and regulations.

Exhibits at all trailheads, except where single trails lead only short distances to viewpoints, will have a standard format including a map, a bulletin board, and an interpretive message. The text for trailhead signs will be specified in the wayside exhibit plan. The maps will be prominent features of the exhibits, made highly visible through their placement rather than size or contrast. They will show the trail configurations, mileages, major features, elevation gains or losses, and relative difficulty. Current safety information and park regulations will be posted on bulletin boards incorporated into the exhibits, allowing for information to be easily updated. Positive wording will be emphasized. Interpretive messages will be included where appropriate in accordance with the wayside exhibit plan. At trailheads for backcountry zones, such as Fiery Furnace and Lost Spring, the messages will emphasize safe backcountry travel and resource protection.

At numerous areas within the park, shortcut trails at trailheads and overflow parking along road shoulders are causing trampling of vegetation and soil erosion. Physical barriers will be installed to prevent these problems and to communicate to visitors the need to protect resources. The barriers need to be effective, visually compatible with the natural scene, and relocatable or removable if necessary. Environmentally compatible fences will be used at

trailheads to prevent shortcutting, and boulders will be used along parking area roadways to prevent shoulder parking. Fencing will be used only in the immediate vicinities of the trailheads, on the same side of the road as the trailhead and not along the roadway. Boulders will be buried to approximately one-third of their depth and installed in informal, irregularly-spaced groupings to ensure a naturalistic appearance.

VISITOR CENTER/HEADQUARTERS

The park headquarters site will be redeveloped to accommodate the new visitor center and to protect visitors, staff, and facilities from flooding (see the site plan map). The proposed new visitor center will be larger and better designed to meet visitor and staff needs. It will include

an entryway, where basic information will be available 24 hours a day

a lobby with an information desk, a scale model of the park, exhibits oriented to trip planning and safety, and a publication sales area

a small exhibit room designed to give visitors an overview of park resources and motivate them to explore the park first-hand

an auditorium

restrooms

offices for visitor center staff

The facility will be fully handicap-accessible and include programs for the sensory and mentally impaired. A detailed discussion of the size and functions of the proposed visitor center is included in appendix D.

The visitor center will be located just northwest of the existing visitor center/administration building. This site offers superb vantage points for visitors to see typical Arches terrain (slickrock slopes, cliffs, towers, and rock wall seeps). The building will have large windows facing north to take advantage of these special features. Windows could be in the lobby and/or incorporated into the auditorium to provide a dramatic conclusion to the audiovisual program. Exhibit space will be windowless to allow maximum flexibility in exhibit design and placement. An outdoor deck will be provided on the north side for outdoor viewing and interpretive talks relating to the scenery. There will be orientation panels on the exterior of the building near the entrance to serve those visitors arriving after hours. Design of the building will also take full advantage of the site's potential for conserving energy by utilizing solar power, wherever conservation of energy can be performed on an economic basis.

The existing visitor center/administration building will be remodeled to house all the Arches administrative offices. The proximity of this building to the new visitor center will facilitate communication among the staff. The building currently has a unisex handicap-accessible restroom and men's and women's restrooms that are handicap-accessible from an outside entrance serving the parking lot; however more work needs to be done to fully meet accessibility standards. This will be accomplished when the building is remodeled.

To minimize congestion on the entrance road, a second entrance station and approach lane will be added adjacent to the existing station. Visitors will turn off to the new visitor center

before driving through the entrance station, allowing them to decide whether or not they want to proceed into the park before they pay their fees. A turnaround lane will be provided for visitors who drive straight to the entrance station and then decide either to go back to the visitor center or to leave the park. During periods of very heavy use, entrance station staff will have the option of allowing those visitors to proceed directly into the visitor center parking lot through a short service/emergency access spur connecting the park entrance road with the parking lot.

The turnoff to the visitor center access road will be a sufficient distance from the entrance stations to prevent cars waiting to go through the entrance stations from blocking the intersection. The new access road will be a sufficient distance from the Canyonlands Natural History Association (CNHA) building (historic caretaker's residence) to preserve the building's landscape setting. The headquarters service road will tie into the new visitor center access road, and the existing turnoff to the service road will be eliminated to reduce the number of intersections and improve the visual quality of the entrance to the headquarters area.

Visitors and staff will share a new parking lot, which will be designed to accommodate 46 cars and 13 recreation vehicles or buses (existing demand plus a projected 36 percent visitation increase factor). Spaces in the row closest to the administration building will be designated for staff.

A new parking lot for the employee apartments will be provided east of the building, and the existing lot in front of the building will be removed. The existing lot is a visual intrusion along the visitor center access road and would not be easily accessible from the adjacent service road once the road is raised for flood protection purposes (see "Floodplain Compliance").

A new collection storage building will be provided northwest of the maintenance building, outside the potential maximum floodplain.

The new visitor center and new collection storage building will be connected to existing water and power sources. The existing water system, with primary and secondary wells, meets all needs at the headquarters area, and the power supply is also adequate. The existing telephone and radio systems are inadequate and will be replaced and extended as necessary to serve the administration and visitor center buildings.

The existing sewage treatment system is adequate to serve existing development and will be retained. The leachfield serving the administration building might have to be relocated in the same general vicinity to accommodate the new visitor center access road. A new sewage treatment system will be developed for the new visitor center. The proposed system will transport effluent to leachfields in the Bloody Mary Wash floodplain east of the maintenance area.

If it is determined that the leachfields must be located above the floodplain, the suitability of upslope areas directly to the north, out of the floodplain, will be determined. If no suitable areas are found, other alternatives will be considered, including the development of flood-proofed elevated sand mounds and the use of flood protection berms as multipurpose flood control/wastewater treatment structures.

A number of actions will be taken to protect people and property in the floodplain (see "Floodplain Compliance").

Several improvements in the visual quality of the headquarters area will be incorporated into the redesign. The contemporary style of most of the existing structures imposes a highly visible intrusion on the natural setting. To establish a more appropriate and consistent architectural motif, the new visitor center and the modern existing structures visible from the entrance road (administration building, library, apartments, and residence 3) will be faced with native materials that will blend with the surrounding landscape and be compatible with the more vernacular stonework of the CNHA building. The high chain-link fence around the weather station, a visual intrusion along the visitor center access road, will be replaced with a nonreflective earth-toned fence to help minimize visual impacts.

Fire protection systems are in place in the CNHA building and the library. An intrusion-detection alarm is also in place in the library. Humidity-control devices will be installed in the museum collection storage building.

MOAB FAULT

The Moab fault is an important part of the geologic story, and the existing overlook is the only place along the road where the faulted landscape can be seen; however, few people stop here because they have just entered the park and are eager to see an arch. The existing wayside exhibit message will be evaluated for its effectiveness and replaced if necessary.

PARK AVENUE

The grandiose view at this first stop along the park road makes it the ideal site for introducing the story of geologic processes as evidenced by sheer walls, a balanced rock, layering, and erosion. Since there is no arch here and the road sign indicates only a hiking trail, visitors currently tend to stop for a very short time, if at all. The road sign will be changed in accordance with the parkwide sign plan to indicate that this is an interpretive stop, and the trailhead sign at the parking lot will emphasize the short distance to the viewpoint. Information about the trail to Courthouse Towers will include distance, type of terrain, walking time, and driving time for those picking up hikers at Courthouse Towers. The name "South Park Avenue" is confusing because there is no corresponding "North Park Avenue." Therefore, the name of this pullout and trailhead will be shortened to "Park Avenue."

The short paved trail out to the Park Avenue viewpoint is handicap-accessible, but the safety of the 6 percent downslope on the last short section of trail is questionable, given its proximity to the sharp dropoff at the overlook. To remedy this problem, the last section of the viewpoint trail will be removed, the slope will be reduced, and the section will be resurfaced to match the existing trail.

A 1/2-mile primitive trail/marked route (class D/E, as described in appendix C) leads from Park Avenue to Courthouse Towers. The trail will be retained at its existing standard.

LA SAL MOUNTAIN VIEWPOINT

This overlook and trailhead will be developed to encourage more visitors to enjoy the views and to offer a similar experience to that available at the overcrowded Fiery Furnace area. This overlook has excellent potential for identifying skyline features, yet few visitors currently

stop here because the name suggests only a view of the La Sal Mountains, which have been visible for some distance along the road. It may be possible to make visitors aware of the excellent views of many important park landmarks by changing the name to something more descriptive, such as Panorama Overlook. The potential name change will be explored in greater detail during preparation of the park's interpretive prospectus and wayside exhibit plan. Exhibitry at the overlook will provide 280-degree skyline identification of the prominent features, including Courthouse Towers, Balanced Rock, the Windows, the La Sal Mountains, and the Spanish Valley escarpment.

A primitive marked route (class E) will be developed from here to lower Courthouse Canyon, which is a red sandstone canyon with an intricate system of tributaries. The route will serve both independent hikers and groups on guided walks that will be offered as an alternative to the Fiery Furnace walks. Trailhead signing will include information about safe travel in desert, slickrock, and canyon terrain.

The layout of the existing parking lot will remain the same, but parking spaces will be striped to make the most efficient use of the existing space. Handicap-accessible parking spaces will be developed near the beginning of the overlook trail, and the trail will be repaved at the proper width and grades to make it fully accessible to all visitors (class A), making this 360-degree skyline panorama available to handicapped as well as other visitors.

The parking lot is reached by way of a short spur road off the main park road. Sight distance is marginal for buses and motorcycles approaching the spur road intersection from the north and for vehicles returning to the main road. To mitigate the limited sight distance, a warning sign will be installed along the main road north of the spur road intersection.

COURTHOUSE TOWERS

Interpretation will continue the geologic story introduced at Park Avenue, focusing on how arches grow and evolve. The existing exhibit "Destiny of an Arch" will be reevaluated for its effectiveness, and the message will be improved as needed. The other existing wayside exhibit on adaptation to the desert will be removed. New exhibits will name the prominent landmarks and provide information about the trail to Park Avenue.

The Park Avenue trail starts/ends across the road from the Courthouse Towers parking lot, making visitors cross the main park road. Signs and a crosswalk will be added to increase the safety of this crossing.

BALANCED ROCK

Balanced Rock is one of the first major park features visible from the main road, and it attracts a majority of park visitors. However, the parking lot, a small pullout adjacent to the road, cannot accommodate even half the existing demand. Because of the congestion, people park wherever they can on both sides of the road, and drivers often have to back into the main road traffic lane to exit the parking lot. People who park across the road, either along the Willow Flats road or at the picnic area, must walk across the main road to reach the interpretive trail. The area will be redesigned to accommodate more people and to make it safer for pedestrians and motorists.

A parking lot with approximately twice the capacity of the existing lot will be developed in the same general area as the existing lot. The new lot will be physically separated from

the main road so that drivers no longer back into the main stream of traffic. The expanded lot will satisfy the off-season demand; however, during the heavier use season, from May to September, many visitors will still not be able to stop and walk the trail. The possibility of constructing a new spur road with a larger parking lot was considered but determined to be infeasible because of the impacts and cost involved. Explosives will not be used during construction of the parking area to avoid any adverse effects on Balanced Rock.

The picnic area will be relocated farther from the main road, and the existing picnicking sites will be blocked off with barriers and revegetated to discourage overflow parking. A crosswalk will be added for people crossing the road from the picnic area to Balanced Rock, and signs will warn motorists approaching from both the north and south of the pedestrian and vehicle congestion in this area.

A new trail will lead from the parking area to a new viewpoint, then connect with the existing trail around the base of Balanced Rock. The trail, whose surface will blend with the natural scene as much as possible, will be handicap-accessible (class A) as far as the new viewpoint only; the remainder of the trail will remain at the existing standard. An exhibit at the viewpoint will explain how Balanced Rock was formed by the erosion of rock strata. Geologic processes will be illustrated through a discussion and photo of the smaller adjacent balanced rock that fell a few years ago. A trailhead sign will invite visitors to continue on the loop trail around the rock. This trail offers a closer look at the precariously balanced rock from all sides and impresses visitors with how large the rock is.

At the existing picnic area picnickers are exposed to traffic noise from the adjacent main road, but at the new location they will be removed from these intrusions and be able to enjoy views of both Balanced Rock and Salt Valley to the north. To minimize the visual intrusion on the natural scene, existing vegetation, instead of architectural structures, will be used to provide shade. The parking area for the picnic sites will be dirt with delineated boundaries and will be located just off the existing dirt road to Willow Flats. The intersection of that road with the main road will be realigned to improve circulation.

About a quarter of a mile west of Balanced Rock on the Willow Flats road there is a materials storage and mixing area that is an intrusion on the otherwise natural scene visible to visitors driving by. No further mixing of road repair materials will be allowed at this location, and space used for storage of materials such as gravel will be limited to 10,000 square feet. All mixing and all other storage will be outside the park.

GARDEN OF EDEN

The name of this site implies the presence of an outstanding feature or viewing opportunity that is not there; however, the site does offer a different perspective of features seen and identified elsewhere and the opportunity for short exploratory walks into adjacent slickrock. The name could be eliminated and the site given a generic identification such as vista point. This potential name change will be explored in more detail during preparation of the park's interpretive prospectus and wayside exhibit plan. No other changes will be made.

THE WINDOWS

The Windows loop road works well for visitor access and circulation, and the parking capacity is adequate. The upper lot is 80-100 percent full on summer weekends, and the

lower lot is rarely if ever full. The only problem with the existing development is the confusing layout of the trails and the lack of handicap-accessible facilities.

The lack of clear trail definition has resulted in trail shortcutting and ever-widening trails throughout the Windows area, causing damage to soils and vegetation. To resolve this problem a new class C perimeter trail will be developed to connect the separate parts of the entire Windows alcove for hikers (see the site plan map). This trail will not simply link the arches but will also provide a variety of hiking experiences ranging from close views of desert washes to expansive vistas. Barriers will be used as necessary to prevent shortcutting at trailheads.

Exhibits at the upper parking area will identify the arches by name and provide comparative information about their types, sizes, and ages. In addition to the standard trailhead exhibit, a handout map will be available to guide hikers through the entire interlinking trail system. A standard trailhead exhibit will also be placed at the lower parking area, and the handout map will be available there, as well.

The opportunity will be provided for all visitors, including people with handicaps, to experience an arch at close range and to enjoy sightseeing and picnicking in the park. Double Arch was chosen for handicap access because, of all the major arches accessible by a short trail from an established parking area, it is the one where a trail of appropriate grade could be developed with the least amount of environmental modification and cost, and because it is convenient for visitors planning to spend only a half day in the park.

The trail to Double Arch will be realigned as necessary to reduce slopes and surfaced to accommodate wheelchairs (see appendix C for a description of standards for class A trails). Boardwalks will be installed where necessary to negotiate washes, and small rest stops with rustic benches will be added at appropriate intervals to benefit all visitors.

The trailhead for this trail will be clustered with other handicap-accessible facilities at the lower parking lot. Facilities will include designated parking spaces, vault toilets, picnic sites, and a crosswalk over to the Double Arch trailhead. If possible, the picnic sites will take advantage of existing vegetation and rock slopes for shade, wind protection, and privacy. Trails to the picnic sites and toilets will be of a standard appropriate for use by visitors in wheelchairs. All handicap-accessible trails will have hardened surfaces textured to blend with the natural ground surface. Care will be taken not to introduce vertical or otherwise visually incompatible elements that would compromise the visual quality of the area.

PANORAMA POINT

This pullout has an excellent view of the Salt Valley (much better than the Salt Valley overlook farther up the road). Thus, interpretation of this superb example of a collapsed and eroded salt anticline will be relocated to this more southerly overlook, whose name may be changed accordingly. The name change will be explored in greater detail during preparation of the park's interpretive prospectus and wayside exhibit plan. Interpretation will explain the collapse of the anticline and why its sides are composed of jointed Entrada sandstone (the Fiery Furnace on the east side of the anticline and Eye of the Whale and Klondike Bluffs on the west side, all visible from this point). The idea of fins as seen across the valley at Fiery Furnace will be introduced here.

The parking area will be striped to improve use of existing space. Handicap-accessible parking spaces will be designated, and a handicap-accessible viewpoint will be developed adjacent to the parking area.

The viewpoint currently used to interpret the Salt Valley will be obliterated. It has low interpretive and recreational value, and the sight distance is limited for a turn at this location. The pavement will be removed and the area regraded and revegetated as necessary to return it to a natural appearance. Revegetation will be funded as part of the cost of removing the pavement.

WOLFE RANCH/DELICATE ARCH TRAILHEAD

On most summer days the demand for parking exceeds the capacity of the parking lot, and visitors have to park along the road. The demand for parking will probably increase once the road is paved; however, because of site constraints the lot will be expanded only to accommodate existing demand (estimated 1989 summer weekend demand; see the site plan map). The one-way circulation pattern will be reinforced by removing the second entrance, which currently encourages some drivers to enter from the wrong direction. Barriers will be maintained or added as necessary to prevent shortcutting on the east side of the lot and to prevent road shoulder parking.

The existing parking lot, vault toilets, and oversized trailhead signs are visual intrusions on the historic scene; however, the ranch was determined to be eligible for the National Register with these intrusions present; therefore, they are not considered a threat to the significant values of the site. To mitigate intrusion on the historic scene the pit toilets will be replaced with handicap-accessible, visually compatible vault toilets located to the south of the trail, where they will be screened from the ranch area by existing natural vegetation. The parking lot will be expanded along its existing axis to avoid disrupting the natural course of the primary washes immediately to the west, and the artificial drainage north of the lot will be redirected as necessary.

A standard trailhead sign will provide information about the trails to the Wolfe ranch, the Ute petroglyphs, and Delicate Arch. An interpretive exhibit at the trailhead will discuss the adaptations necessary for survival in a desert environment where the availability of water fluctuates so greatly. The special problems and adaptations of plants, animals, settlers, and Indians will be compared. Another interpretive exhibit will be placed at the Wolfe ranch to discuss the history of the ranch and the effects ranching has had on the land.

The gravel trails leading to the Wolfe ranch and Delicate Arch will be retained at their existing standards. The trail to the ranch is accessible to most handicapped persons. The Ute petroglyphs near the Wolfe ranch are not served by any formal trail, but visitors have learned of them and created numerous social trails to the site, which is damaging the vegetation. To minimize impacts in this area, a single trail to the Ute petroglyphs will be clearly defined and maintained at a class C standard, and other unofficial trails will be obliterated and revegetated. A low barrier will be provided at the petroglyphs, and a small wayside exhibit will discuss the importance of protecting the panel.

Actions to mitigate the flood hazard in this area are described under "Floodplain Compliance," below.

DELICATE ARCH VIEWPOINT

A new Delicate Arch viewpoint will be developed to provide a more dramatic view of the arch with less intrusion on the views seen by people who are at the arch. The new viewpoint will be approximately 0.2 mile south of the existing viewpoint, accessible from the existing road. From this location the sky is visible beneath the arch, making it more distinct on the skyline. Also, vehicles at the new viewpoint parking area will not be visible to people who have hiked up to the arch and are standing in its vicinity.

It may be necessary to relocate or to provide traffic barriers along the Cache Valley four-wheel-drive road to eliminate its use as overflow parking on busy weekends.

Interpretive exhibits at the new viewpoint will explain the formation and features of Delicate Arch. The viewpoint will be accessible to all visitors, including the elderly and handicapped. Parking will be provided for cars and buses. Management will be oriented towards capturing the majority of visitors wishing to view Delicate Arch at this new viewpoint, thus reducing the number of visitors traveling to the upper trailhead parking lot.

The existing viewpoint will be retained as a trailhead. The parking lot will be redesigned to provide a turnaround that will accommodate large vehicles and parking space for people wishing to walk the existing viewpoint trail. Design will capitalize on topographic screening to hide a portion of the parking area from views from the arch. A standard trailhead sign will provide information about the view from the trail and let visitors know that the trail does not go to Delicate Arch itself. Delicate Arch will not be interpreted at this location.

FIERY FURNACE

Guided interpretive walks into the rugged Fiery Furnace area have traditionally been offered to guide visitors through steep and confusing terrain in a safe, enjoyable, and resource-conscious manner. The objective of these guided tours is to introduce visitors to unique geologic features and plant life. Guided tours are necessary because the terrain is extremely difficult to travel in and visitors may have difficulty finding their way through the fins. The ideal group size for the guided tours is 20, yet because of the popularity of these walks, as many as 145 visitors have shown up. Even the average size of tours is too large to achieve the feeling of unrushed exploration in a "wilderness of rock."

Although hikers are not required to be accompanied by a guide, there is no self-guiding route through the Fiery Furnace. Some of the park staff believe that a self-guiding trail would be unsuitable because of hazardous slickrock and deep crevices. The existing wayside exhibit and ambiguous trail access offer little encouragement for visitors to explore on their own. Trail shortcutting and other damage is often a result of those who do attempt to find their way into the Fiery Furnace.

Guided walks through Fiery Furnace will continue, but the number of people on any one hike will be limited to 25. This will be made possible by offering four walks per day (instead of one), possibly by requiring advance reservations, and by providing the option of taking a walk through Courthouse Canyon. For visitors inclined to visit Fiery Furnace on their own, a standard trailhead sign will provide information about the difficulty and potential hazards of independent exploration and a discussion of trail abuse problems and how visitors can help prevent them. Undesignated trails will be obliterated and revegetated. Barriers will be added to prevent shortcutting at the trailhead and other points adjacent to the parking area.

SAND DUNE ARCH TRAILHEAD

The Sand Dune Arch trailhead will be redesigned and expanded to adequately serve the Lost Spring Canyon area in addition to Sand Dune Arch and Broken Arch. A new parking area with approximately twice the capacity of the existing pullout will be developed in the low area between the main road and the rock outcrop to the east (see the site plan map), where it will be least visible from the trail. The entrance to the parking will be realigned to improve the sight distance. The National Park Service will cooperate with the Bureau of Land Management to create a new class D trail to Lost Spring Canyon. The trail will head north from the parking area to the south arm of the canyon, then descend the canyon floor following the natural gas pipeline. A trailhead sign will provide special information about traveling in primitive areas (Lost Spring Canyon) in a manner that is safe and least damaging to fragile resources as well as standard information about the trails to Sand Dune Arch and Broken Arch.

DEVILS GARDEN TRAILHEAD

From May to September, the parking demand at the Devils Garden trailhead is approximately double the existing capacity, requiring visitors to park along the shoulder of the access road, where they damage vegetation and aggravate the congestion problem. Because of the shortage of parallel parking spaces for larger vehicles, RVs and buses often take up several car spaces, which also contributes to congestion. To solve these problems, the capacity of the parking area will be increased to accommodate existing (1989) estimated summer weekend demand, with buses and RVs separated from automobiles. Barriers will be added along the access road to prevent shoulder parking.

The existing signs will be replaced with a standard trail sign with a trail map informing visitors of hiking distances and times, trail conditions, and safe travel techniques. A new self-guiding trail leaflet will more clearly show the trail route to Landscape Arch and the whole trail system in Devils Garden beyond.

The log and rope barriers used to prevent shortcutting on the trail near Landscape Arch have been the subject of criticism, and they will be replaced with more visually compatible barriers. An interpretive exhibit at Landscape Arch will describe the efforts to restore the vegetation and emphasize the importance of staying on the designated trails. Photos will be used to illustrate the progress made in restoring the area.

The trailhead needs its own restrooms because the picnic area facilities are more than a quarter of a mile away. The existing trailhead vault toilet is inadequate to handle demand during the high-use season, and it becomes malodorous during the warmer months. It will be replaced with a new comfort station with flush toilets.

The generator at the maintenance area can be heard occasionally at the trailhead and the campground entrance. The generator housing will be replaced with a soundproofing structure to help confine the motor noise to the immediate area. The amount of stored materials and number of parked vehicles at the maintenance area will be limited to control the visual intrusion on the natural scene. The temporary materials storage area adjacent to the generators will be limited to 1,500 square feet and will not be used extensively as an area to store equipment.

DEVILS GARDEN CAMPGROUND

The 53-site campground is full six months of the year, from mid-April to mid-October. Ten tent walk-in sites will be added to provide separate sites for tent campers. At present, there is no separation between tent and RV sites, and noise from RV motors impinges on the experience of tent campers. The new walk-in sites will be located where the terrain is suitable for shade, wind protection, and privacy, close to an existing comfort station, and at a distance from the group camping sites.

In spite of the fact that many people who would prefer to camp at Arches cannot find sites, no further campground expansion will occur. The number of drive-in sites will remain limited to ensure that the quiet camping experience in relatively natural surroundings now available is maintained. Additional demand can be satisfied by private campgrounds in the Moab area and public campgrounds in nearby state and federal areas.

A handicap-accessible campsite and restroom are already available, and they will be retained.

The road and campsite surfaces are already scheduled for rehabilitation, which will solve the drainage problems and enlarge the few drive-in sites that are not currently large enough to accommodate RVs.

The three campground comfort stations are in need of rehabilitation to correct problems including insufficient water pressure. Upgrading the water and sewer systems within the campground will involve adding water distribution lines, adding a float valve in the reservoir, connecting the first campground comfort station to the new sewage treatment system, and replacing flush valves with flush tanks in all three comfort stations.

The current lack of a sanitary dump station has led to cases of illegal dumping along park roads. A new dump station will be developed near the campground intersection, where it will be accessible to visitors as they leave the campground and will not introduce more development into the campground.

The size and design of the existing amphitheater compromises program quality and visitor enjoyment. The 105-capacity seating area is too small, and at 80 percent of the programs several people must stand. Periodic replacement of the rustic benches is required. The projection box is vulnerable to break-in, and there is no amplification system, making communication with the audience very difficult on windy nights. Drainage is poor, and after a rain the ranger must stand in mud. A paved walkway leading to the amphitheater is accessible by wheelchair; however, handicapped visitors cannot actually reach a convenient viewing area because the walkway stops at the edge of the amphitheater. Wheelchairs sitting at the edge of the walkway obstruct people's movement into and out of the amphitheater. The amphitheater will be expanded and redesigned to solve these problems. The new amphitheater will have a 120-person capacity and include a viewing area for handicapped persons. The seating will be integrated into a rock slope (see sketch) and be oriented to views of Skyline Arch and the La Sal Mountains.

Occupancy at Devils Garden by two seasonal employees is required to provide adequate visitor safety and resource protection. However, the large temporary trailer now used as a ranger station and ranger residence is unsightly. Also, its location does not allow enough privacy for the resident rangers. The housing management plan for Arches gives first priority to replacing this trailer with permanent residences. The two proposed ranger residences and a new ranger station will be built near the existing trailer site (see the site

plan map for the Devils Garden trailhead and loop road). Part of the existing trailer pad will be retained for use by a campground host. The campground host will handle the routine administration of the campground, while the rangers will handle resource management and visitor protection. Clustering the new facilities will facilitate communication between visitors, the campground host, and the rangers; minimize visual intrusion; and reduce the impact and cost of new utility systems. The location of the new residences will afford the rangers some privacy while still making them accessible to visitors and the campground host in the event of an emergency. The proposed site for the residences has uneven terrain and is close to small drainage channels, which will require sensitive design to minimize impacts on the natural landscape.

Visitors and rangers currently share the same small parking lot, which results in crowding and overflow parking along the road. Visitors will have separate parking in the future. Visitors will be able to park and access the ranger station from either the loop road or the campground road. The station, the parking, and the walkways will be handicap-accessible.

Circulation in the campground intersection area is congested and awkward. There is not enough space for larger vehicles to turn around, either at the intersection or elsewhere along the loop road. Circulation will be improved by adding a one-way turnaround lane at the south end of the loop and by providing space for vehicles to turn around at the campground intersection (see the site plan map).

MOAB PANEL

An exhibit will be installed at the Moab rock art panel to promote visitor understanding and appreciation of this important cultural resource and the problems of protecting it. A color photograph will illustrate how the panel looked before it was vandalized. To help deter further vandalism, a low metal barrier will be installed in front of the panel. The barrier will be as visually compatible with the scene as possible and will not obstruct visitors' views of the rock art. An interpretive message incorporated into the exhibit will explain why a barrier has been erected to protect the panel from further defacement.

Redesign of US 191 in this vicinity is planned by the Utah Highway Department to improve the bridge and curve at Courthouse Wash. The National Park Service has requested that the Highway Department provide parking on the north side of the road for people interested in seeing the Moab panel, so that they no longer have to cross the highway from an informal pulloff on the south side. The department has declined the request, but there is still a need for parking in this area, so the National Park Service will continue to work to resolve this issue as the highway redesign proceeds. Once safe parking is in place, a trailhead sign and defined trail will be provided.

FLOODPLAIN COMPLIANCE

The most serious floodplain problems addressed by this plan occur at the existing park headquarters site. The flood hazard will be mitigated by designing physical protection and warning systems, rather than by relocating facilities. The "Statement of Findings for Floodplains" is included in appendix F.

Two additional culverts faced with stone to appear similar to the existing bridge will be installed where the park entrance road crosses Bloody Mary Wash. This will allow a much larger flow to be transmitted directly down the channel and reduce the amount of water

diverted northward in the event of a severe flood. In addition, sections of the park entrance road and the service road, totaling about 1,600 linear feet, will be raised an average of 4 feet. With these modifications, all areas where visitors or staff might congregate and all facilities and developments west of where the entrance road crosses Bloody Mary Wash will be outside the 500-year floodplain of Bloody Mary Wash. The housing east of the road is already out of the floodplain; however, the maintenance building will remain in the 500-year floodplain. Also, throughout the headquarters area, many facilities and developments will remain susceptible to floodwaters in the event of a probable maximum flood (PMF). Although PMF protection is preferred for flash-flood areas, structural modifications (such as berming or raising the road surface) will not be made to provide this level of protection because they would result in an unacceptable degree of visual impact.

To further protect the developed area from floodwaters coming from the slickrock slopes to the north, the existing drainage channel just north of the new visitor center will be widened, deepened, and stabilized, and the berm on the south side of the channel (now 2 to 5 feet high) will be raised by no more than 2 feet. Raising the berm more than 2 feet would cause adverse visual impact. Some of the runoff that enters this channel from the west might be redirected to flow into another channel on the west side of the main park road, thus diverting it away from the headquarters area, if necessary, to help protect the headquarters area. Additional floodplain and topographic information must be gathered and analyzed before determining whether that action will be necessary. Further action to protect the headquarters area from a 500-year flood of runoff coming from the north is not considered feasible because of the adverse environmental effects.

To mitigate remaining flood hazards, the feasibility of a flood-warning system will be determined, and subsequently, an emergency flood response and evacuation plan will be prepared to warn visitors and staff throughout the headquarters area. No new facilities will be constructed in the headquarters area until after the feasibility of a warning system has been proven. If a warning system is not feasible (considering the required time for adequate response/evacuation), then no facilities will be constructed and other alternatives will be considered. Alarms will be placed in all structures within the probable maximum floodplain, including the visitor center, the administration building, the CNHA office building, the library, residence 3, the apartments, and the maintenance building. The new visitor center and adjacent areas will be designed to minimize susceptibility to tributary flooding. Potentially hazardous materials and water treatment facilities at the maintenance complex will be structurally floodproofed. Provisions will also be made for emergency water, sewer, power, and telephone service in the event of damage to utility lines. To ensure emergency radio contact in the event of a severe flood, a high priority will be given to replacement of the existing radio system, which transmits through telephone lines, with an independently operable system.

Museum collections will be removed from the floodplain, as described under "Cultural Resource Management".

A floodplain study will be completed for the Wolfe ranch/Delicate Arch trailhead area on a high priority basis, the results used to evaluate the proposal for the area, and modifications made as necessary (see "Future Plans and Studies"). The parking area and vault toilets will be kept out of the higher velocity sections of the high-hazard flood area, but on-site interpretation facilities at the ranch will remain within the 100- or 500-year floodplain. An emergency flood response plan will be developed for this area. Signs will be posted in the parking area warning visitors to climb to high ground in case of flash flooding, and similar messages will be included in the park's informational literature. Washes will be bridged to protect travelers and the road from flooding.

DEVELOPMENT PRIORITIES AND COSTS

Phasing priorities and estimated development costs are summarized below. The estimates represent gross costs (including project planning, construction supervision, and contingencies) in 1988 dollars. The portions of the total project costs eligible for Federal Lands Highway program (FLHP) funding are also identified.

1.	Rectify visitor and staff vulnerability to high-hazard conditions:	
	--Install culverts in entry road, elevate road sections, enlarge/stabilize tributary channel, and replace radio system at headquarters *($107,500 FLHP eligible)*	$ 570,200
	--Develop emergency flood-warning system and response plan for headquarters, and emergency flood response plan for the Wolfe ranch	91,800
	--Construct bridges across Salt Valley, Salt, and Winter Camp washes along Delicate Arch road *($397,800 FLHP eligible)*	397,800
	--Add pedestrian crosswalk and warning signs at Balanced Rock *($2,500 FLHP eligible)*	2,500
	Subtotal *($507,800 FLHP eligible)*	**$ 1,062,000**
2.	Rectify vulnerability of people to moderate hazards and threats to facilities:	
	--Add pedestrian crosswalk and warning signs at Courthouse Towers *($2,500 FLHP eligible)*	$ 2,500
	--Reduce grade of Park Avenue handicap-accessible trail	5,000
	--Add sign to warn of limited sight distance near La Sal Mountain viewpoint *($1,000 FLHP eligible)*	1,000
	--Add comfort station with flush toilets at Devils Garden trailhead	235,000
	--Floodproof water treatment facility and potentially hazardous materials at headquarters maintenance area	46,800
	Subtotal *($3,500 FLHP eligible)*	**$ 290,000**
3.	Protect natural and cultural park resources from abuse and overuse:	
	--Provide physical protection for Moab and Wolfe ranch rock art panels	$ 3,800
	--Protect museum collection and custodian's residence at headquarters	100,000
	--Add sanitary dump station at Devils Garden	54,600
	--Install barriers to prevent trailhead shortcutting and shoulder parking *($154,000 FLHP eligible)*	163,500
	--Limit size and uses of materials storage areas near Balanced Rock and Devils Garden	15,300
	--Implement visitor impact management program (cost to be determined later as a component of NPS construction packages)	
	Subtotal *($154,000 FLHP eligible)*	**$ 337,000**

4.	Provide facilities needed to accommodate existing demand:	
	--Develop a new Arches visitor center with parking and other support facilities	$ 3,671,400
	--Pave Delicate Arch road *($1,336,200 FLHP eligible)*	1,336,200
	--Rehabilitate main road and pullouts and restripe some existing parking areas *($5,489,700 FLHP eligible)*	5,489,700
	--Develop new parking, trail, and picnic area at Balanced Rock *($80,300 FLHP eligible)*	111,800
	--Expand and pave parking, rehabilitate trails, and replace exhibits and toilets at Wolfe ranch *($172,200 FLHP eligible)*	238,100
	--Provide new Delicate Arch interpretive viewpoint *($247,400 FLHP eligible)*	247,400
	--Improve Delicate Arch trailhead	159,000
	--Expand trailhead parking, add visitor contact station, redesign campground road intersection area, redesign amphitheater, add tent walk-in sites, and rehabilitate comfort stations *($118,000 FLHP eligible)*	492,100
	--Add or replace waysides at several locations	15,000
	--Face existing headquarters buildings with stone	237,200
	Subtotal *($7,443,800 FLHP eligible)*	**$11,998,000**
5.	Improve the quality of the working environment at Arches and increase management efficiency:	
	--Remodel the existing visitor center to house all park administrative offices and workspace	$ 29,700
	--Provide new ranger residence and host site and make necessary modifications to utility systems at Devils Garden	451,800
	--Close and restore the Salt Valley overlook *($37,400 FLHP eligible)*	37,400
	Subtotal *($37,400 FLHP eligible)*	**$ 519,000**
6.	Provide for new visitor opportunities at Arches:	
	--Develop handicap-accessible facilities and new primitive trail at Windows *($6,400 FLHP eligible)*	$ 202,500
	--Develop new primitive route and make viewpoint trail handicap-accessible at La Sal Mountain viewpoint *($4,000 FLHP eligible)*	30,100
	--Expand parking and trails at Sand Dune Arch trailhead *($57,400 FLHP eligible)*	61,500
	--Construct handicap-accessible viewpoint at Panorama Point *($6,700 FLHP eligible)*	10,600
	--Formalize trail and add identification sign at Moab rock art panel (if Utah Department of Transportation establishes safe parking area)	27,000
	Subtotal *($74,500 FLHP eligible)*	**$ 332,000**
	Total gross development costs *($8,221,000 FLHP eligible)*	**$14,538,000**

STAFFING

Arches National Park will continue to be managed as a unit of the Southeast Utah Group. Management assistance will be available from the group office, particularly in areas of administration and maintenance. Personnel from Arches may occasionally be used to assist other areas in the group on large-scale projects requiring employees with special expertise or with operations such as fee collection and trails maintenance. Performance of activities at the existing staffing level is dependent on supplemental labor obtained through programs such as Student Conservation Aids, the Green Thumb program, the Federal Job Training Partnership, the Work Experience and Training program, and other state of Utah social programs

Proposals to increase resource protection and interpretive programming and to provide additional park facilities will require additional staffing. Staffing requirements will increase by 1.0 full-time equivalent (FTE) position in the Division of Management Administration, 4.3 FTEs in the Division of Interpretation, 4.0 FTEs in the Division of Resource Management and Visitor Protection, and 4.8 FTEs in the Division of Maintenance. Total staffing will be 31.4 FTEs at full plan implementation (see table 2). The work to be performed by the additional staff is described in appendix E.

Most of the staff will continue to live outside the park The park's approved *Housing Management Plan* calls for housing for four permanent employees and 12 to 15 seasonal employees inside the park. This level of housing is adequately met with the exception of the housing for two required seasonals at the Devils Garden area, which will be upgraded from a trailer to permanent residences.

Table 2: Staffing Requirements

Position	Grade	Salary (1988 $)	FTE
Division of Management and Administration			
Existing Staff			
Superintendent[1]	GS 12		1.0
Administrative clerk	GS 05		1.0
Additions to Staff			
Clerk typist	GS 04		1.0
	Increase[2]	$ 19,600	1.0
	Subtotal	$ 75,900	3.0
Division of Interpretation			
Existing Staff			
Chief[1]	GS 11		1.0
Park ranger[1]	GS 05/07/09		1.0
Park ranger (seasonal)	GS 04		2.3
Additions to Staff			
Park ranger (seasonal)	GS 06		0.7
Park ranger (permanent part-time)	GS 05		0.8
Park ranger (seasonal)	GS 05		2.8
	Increase[2]	$ 77,300	4.3
	Subtotal	$162,700	8.6
Division of Resource Management and Visitor Protection			
Existing Staff			
Chief ranger[1]	GS 11		1.0
Park ranger[1]	GS 05/07/09		1.0
Park ranger (seasonal)	GS 05		2.1
Park ranger (seasonal)	GS 03		1.9
Additions to Staff			
Park ranger (permanent part-time)	GS 05		0.8
Park ranger (seasonal)	GS 05		2.1
Park ranger (seasonal)	GS 03		1.4
	Increase[2]	$ 74,000	4.3
	Subtotal	$189,100	10.3
Division of Maintenance			
Existing Staff			
Chief of Maintenance[1]	WS 09		1.0
Maintenance worker[1]	WG 09		1.0
Maintenance worker (permanent part-time)	WG 08		0.8
Maintenance worker (seasonal)	WG 05		1.7
Maintenance worker (seasonal)	WG 03		0.5
Additions to Staff			
Maintenance mechanic (seasonal)	WG 09		1.5
Maintenance worker leader	WL 06		1.0
Maintenance worker (seasonal)	WG 05		0.5
Maintenance worker (seasonal)	WG 05		0.5
Maintenance worker (seasonal)	WG 03		1.3
	Increase[2]	$114,500	4.8
	Subtotal	$240,400	9.8
Total		$668,100	31.7
Total increase over existing staff		$285,000	14.4

[1]Denotes existing positions that would receive a grade level increase under the plan. Proposed grade levels as well as salary figures for those levels are listed.
[2]Increase totals include salaries that accompany proposed grade level increases.

FUTURE PLANS AND STUDIES

FLOOD STUDIES AND PLANS

An emergency flood warning and response plan will be prepared and implemented to warn of an oncoming flood up to the level of a probable maximum flood in any area of the park susceptible to flooding. The plan will address issues such as design and installation of a flashflood warning alarm system and evacuation procedures for visitors and staff at headquarters, the Wolfe ranch, and other areas as necessary.

A study will be conducted to determine the extents of the 100-year, 500-year, probable maximum, and flashflood floodplains in the Wolfe ranch area. Depending on the result, the Wolfe ranch site plan will be refined or modified as necessary to ensure public safety and protection of property.

VISITOR IMPACT MANAGEMENT PROGRAM

A Visitor Impact Management program will be implemented to help managers identify and predict impacts of management strategies on resources and visitor experiences, and to help determine visitor carrying capacities for different park resources (see appendix A).

INTERPRETIVE PROSPECTUS

The Harpers Ferry Center will prepare a new interpretive prospectus to replace the currently outdated one. The prospectus will be a comprehensive parkwide plan to define interpretive content and media. This plan will address the needs of mobility, sensory, and mentally impaired persons and propose programs to meet their needs.

VISITOR CENTER FACILITY PLAN

The Harpers Ferry Center will prepare a detailed facility plan concurrently with the preparation of the comprehensive design for the new visitor center to ensure that the building and its interpretive contents, such as exhibits and audiovisual media, are compatible and functional and that they address the needs of mobility, sensory, and mentally impaired persons.

PARKWIDE SIGN PLAN

A sign plan will be prepared by the park staff to establish a common format and appearance for all park signs. Park signs should be compatible with the natural features of the park, yet easily visible from roads or at trailheads. Sign messages should be clear, concise, and quickly understood. Regardless of the message conveyed, each sign should be recognizable as an Arches National Park sign. The sign plan will be prepared before the wayside exhibit plan described below so that exhibit planners can follow park sign standards.

WAYSIDE EXHIBIT PLAN

A wayside exhibit plan will be prepared by the Harpers Ferry Center to identify the messages and the materials for the proposed wayside exhibits. The exhibit hardware will be compatible with the parkwide sign format.

COLLECTIONS MANAGEMENT PLAN

A collections management plan will be prepared to help direct activities related to both cultural and natural collections. If Arches serves as the depository for the entire Southeast Utah Group, the need for this plan will be particularly high.

RESOURCE MANAGEMENT STUDIES

Numerous resource studies are proposed in the park's approved *Natural Resource Management Plan* and *Cultural Resource Management Plan*.

AGENCIES CONTACTED

FEDERAL

Advisory Council on Historic Preservation, Washington, D.C.
Army Corps of Engineers, Salt Lake City, UT
Department of Energy
  Federal Energy Regulatory Commission, Salt Lake City, UT
Environmental Protection Agency, Denver, CO
Department of the Interior
  Bureau of Land Management
    Utah State Office, Salt Lake City, UT
    Moab District Office, Moab, UT
    Grand Resource Area Office, Moab, UT
  Fish and Wildlife Service

STATE

Department of Agriculture, Salt Lake City, UT
Department of Community and Economic Development, Salt Lake City, UT
  Division of Environmental Health, Salt Lake City, UT
Governor's Office, Salt Lake City, UT
Department of Natural Resources, Salt Lake City, UT
  Division of Energy Conservation and Development
  Division of Lands and Forestry
  Division of Oil, Gas, and Mining
  Division of Parks and Recreation
  Division of Water Resources
  Division of Water Rights
  Division of Wildlife Resources
  Utah Energy Office
  Utah Geological and Mineral Survey
Division of State History, Salt Lake City, UT
  State Historic Preservation Office
Department of Transportation, Salt Lake City, UT, Price UT
Office of Planning and Budget, Salt Lake City, UT

COUNTY

Grand County Commission, Moab, UT
Southeast Utah Association of Local Governments, Price, UT

APPENDIXES

A: VISITOR IMPACT MANAGEMENT PROGRAM

B: ROAD SYSTEM EVALUATION

C: TRAIL STANDARDS

D: VISITOR CENTER FUNCTIONS AND SIZE REQUIREMENTS

E: WORK TO BE PERFORMED BY ADDITIONAL STAFF

F: STATEMENT OF FINDINGS FOR FLOODPLAINS

APPENDIX A: VISITOR IMPACT MANAGEMENT PROGRAM

INTRODUCTION

A major planning and management goal for Arches National Park is to provide for amounts and types of visitor use consistent with management objectives for park resources and visitor experiences. The best way to prevent the degradation of resources or experiences and to avoid costly long-term corrective management is to identify the potential impacts of development before initiating further construction. The Arches Visitor Impact Management program, based on a process developed for the National Parks and Conservation Association (Graefe et. al 1987), will help managers identify and predict impacts and determine visitor carrying capacities for different park resources.

PROCESS OUTLINE AND EXAMPLE

The VIM process is guided by management objectives and standards of acceptable change for key impact indicators. Management strategies are developed to address impacts identified through comparison of existing conditions with the standards of acceptable change. An outline of the VIM process, with an example of how the process can be applied, is shown in the accompanying chart. The description of indicator monitoring has been simplified in the example.

The VIM program will address impact management in backcountry and frontcountry areas. Impact indicator standards and management strategies will be based on the type of resource management and visitor experiences specified by park management objectives. These management objectives may vary for each area of the park. For example, in a backcountry area, where management objectives strive to provide the visitor a sense of remoteness and solitude and where vegetation damage and development are unacceptable, management may opt to redirect visitors to other areas rather than harden or modify the site.

POTENTIAL IMPACT INDICATORS

The VIM program will address three main elements: natural resources (including flora, fauna, soils, and air and water quality); cultural resources (including archeological and historic resources); and visitor use (including distribution, expectations, and preferences).

Impact indicators and acceptable impact standards will vary for different areas depending on established management objectives for those areas. A list of potential resource and visitor experience indicators is provided at the end of this discussion.

IMPLEMENTATION

The VIM program will be initiated at least three years prior to the beginning of comprehensive design for any construction beyond that proposed by this *General Management Plan*. Park staff and consultants will be used to implement the VIM program.

Because of the proximity between Arches and Canyonlands national parks and the interrelated nature of resources and visitor experience opportunities at the two parks, implementation of a VIM program is also recommended for Canyonlands.

Visitor Impact Management Program Process
(Adapted from Graefe et. al. 1987, p. 12)

PROCESS	EXAMPLE
Review Management Objectives Review park management objectives and revise as appropriate as part of updating The park's "Statement for Management" Product: up-to-date statements of resource and visitor experience objectives for specific park areas	At the Windows area, accommodate as much as possible of the increasing demand for visitor use in a relatively structured environment while preserving park resources and a desirable visitor experience
Review Existing Data Base Identify information required to address management objectives when implementing the VIM program Product: list of research inventory and data collection needs	Initiate vegetation study and visitor survey
Select Key Impact Indicators Identify measurable ecological and social variables relevant to management objectives Product: impact indicator list with units of measurement	Percent vegetation cover (this is one of several impact indicators that would be used)
Develop Standards for Key Impact Indicators Based on management objectives, describe minimum acceptable conditions for each impact indicator Product: quantitative statements of minimum acceptable degradation limits that can be monitored	No more than 10% reduction in vegetation cover due to trampling from visitor use

Compare Standards with Existing Conditions

Field assessment of impact indicators

Existing--15% reduction
Standard--10% reduction

Product: determination of consistency or discrepancy of existing conditions with impact indicator standards

DISCREPANCY

Identify probable causes of impacts

Examine visitor use patterns and other potential causes of impacts

Visitors not staying on trails because of inadequate trail definition

Product: description of causes of discrepancies

Identify alternative management strategies

Examine the full range of direct and indirect management strategies which could be used to correct discrepancies

(a) improve trail definition through control structures or hardening
(b) encourage visitors to stay on trails through interpretation
(c) revegetate damaged areas
(d) redirect visitors to other areas
(e) close trail to use

Product: description of potential management strategies

Management decision and implementation

Implement and monitor the effectiveness of management strategies

Combination of (a), (b), and (c) (improve trail definition, use interpretation to encourage staying on trails, and revegetate damaged areas)

Product: action plans and implementation

MONITOR

Potential Impact Indicators

Natural Resource Indicators

Water quality (e.g. fecal coliform/strep, chemistry, turbidity/sediment load)
Soil compaction, infiltration, bulk density
Erosion (e.g., pedestalling)
Cryptogamic cover
Presence of pest faunal species (e.g., beggar rodents and birds, ants and other insects)
Presence and vigor of small mammals, reptiles, ungulates, and predators (e.g., number of species, number of individuals, population structure)
Percent vegetation cover
Vegetative vigor (e.g., reproductive structures, disease, breakage, age structure)
Vegetative species composition (e.g., exotics, resistant species, woody vs. herbaceous species)
Presence and vigor of sensitive resources (e.g., raptors, threatened and endangered species, unique and rare plants)

Cultural Resource Indicators

Presence of significant undisturbed cultural deposits
Presence of sites possessing sensitive artifacts and/or features
Evidence of illegal surface collection, excavation, or malicious vandalism
Evidence of trailing or trampling through sites
Evidence of graffiti at rock art sites
Degree of structural stability (of historic structures)

Visitor Experience Indicators

Number of encounters with others visitors (e.g. per day, per hour, by location, by size of group)
Amount of conflict caused by encounters with different visitor types (e.g. involved in different activities, using different modes of transportation)
Perception of crowding
Perception of impact on environment (e.g. litter, erosion, graffiti)
Perception of level of development
Perception of noise level
Number of visitor complaints
Number of visitors not returning to an area because of dissatisfaction with changes in management or level of development

APPENDIX B: ROAD SYSTEM EVALUATION

PURPOSE

The purpose of this road system evaluation is to document existing road conditions and uses, and to establish a framework for systematic improvements to the park's roads under the Federal Lands Highway Program (FLHP) and line item funding. This will be accomplished by identifying issues, inventorying the existing road system, classifying all park roads according to their function and use, and proposing solutions to the issues.

The *General Management Plan* (GMP) provides the planning framework and direction upon which this road system evaluation is based. The GMP is being prepared to help fulfill management objectives; resolve a number of parkwide issues; and guide management, use, and development of Arches National Park for the next 10 to 15 years. The primary objectives of the GMP are to protect and preserve the natural and cultural environments; to permit biological, geological, and other natural processes to continue with a minimum of human disturbance; and to provide opportunities for visitors to enjoy and understand the significance of park resources.

FUNCTIONAL CLASSIFICATION

For purpose of functional classification, the routes that make up the park's road system are grouped into two categories: public use roads and administrative roads.

The assignment of a functional classification is not based on traffic volumes or design speed but on the intended use of that particular road or route (refer to the Road System Route Numbers map).

Public Use Roads

All roads that are intended principally for the use of visitors for access into and within the monument are classified as public use roads. This includes all roads that provide vehicular passage for visitors or access to such representative areas as points of scenic or historic interest, campgrounds, and picnic areas.

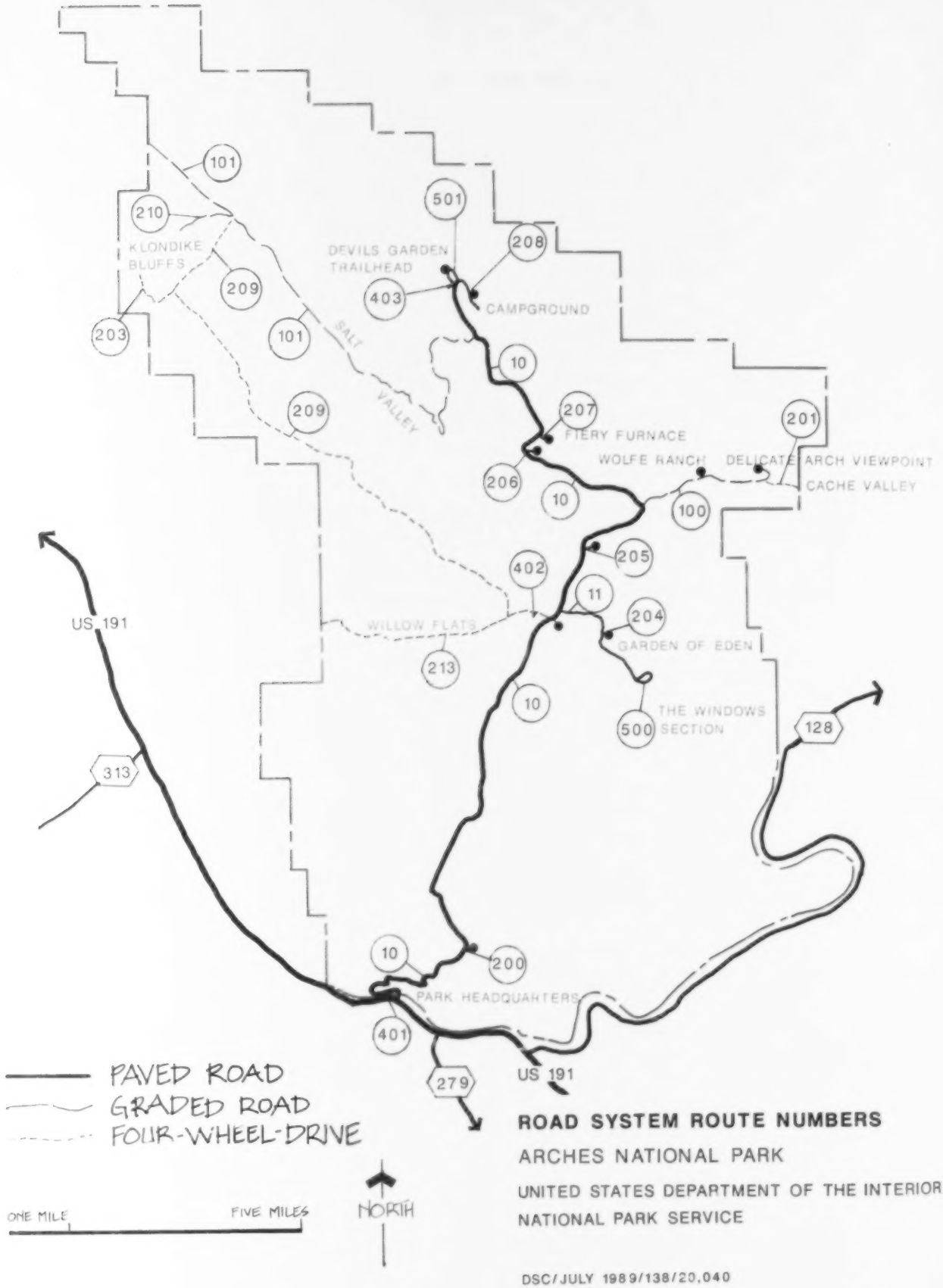
Public use roads are subdivided into the following four classes:

Class I: Principal Road/Rural Parkway. Roads that constitute the main access route, circulatory tour, or thoroughfare for visitors.

Class II: Connector Road. Roads that provide access within the park to areas of scenic, scientific, recreational, or cultural interest, such as overlooks, and campgrounds.

Class III: Special Purpose Road. Roads that provide circulation within public use ares, such as campgrounds, picnic areas, visitor center complexes, and concessioner facilities. These roads generally serve low-speed traffic and are often designed for one-way circulation.

Class IV: Primitive Road. Roads that provide circulation through remote areas and/or access to primitive campgrounds and undeveloped areas. These roads frequently have no minimum design standards and their use may be limited to specially equipped vehicles.



ROAD SYSTEM ROUTE NUMBERS

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,040

Administrative Roads

The administrative road category consists of all public and nonpublic roads used principally for administrative purposes. It includes roads serving employee residential areas, maintenance areas, and other administrative developments, as well as restricted patrol roads, truck trails, and similar service roads.

Administrative roads are subdivided into two classes:

Class V: Administrative Access Road. All public roads intended for access to administrative developments or structures such as park offices, employee quarters, or utility areas.

Class VI: Restricted Road. All roads normally closed to the public, including patrol roads, fire roads, truck trails, and other similar roads.

INVENTORY AND ANALYSIS

This section inventories the existing road system and proposes a functional classification for each road in the park based on information provided by the *General Management Plan*. It also points out environmental considerations, and discusses other items that should be considered during further road planning, design, and construction.

Table D-1 displays the monthly and annual visitation for 1987 as well as the seasonally adjusted average daily traffic volumes for the park's major roads. This data will be shown in table D-3: Road System Evaluation, which should be used for any future road design at Arches National Park.

Table D-2 indicates that during 1987 bus volumes were relatively low. However, it should be noted that the buses primarily travel on the north-south main road, the Windows road, and the first half of the Delicate Arch road. Bus volumes are concentrated during five months of the year, which could lead to periodic conflicts between bus, vehicular, bicycle, and pedestrian traffic.

Table D-3 displays each road's functional classification and the information necessary to make the determination. In addition, other categories are displayed on the table that are to be used during the future planning, design, and construction of park roads. They include design volumes as expressed by average daily traffic, existing road components (terrain, road surface type and width, and speed limit) and any other considerations such as safety and environmentally sensitive resources.

Table D-1: 1987 Visitation and Seasonally Adjusted Average Daily Traffic (ADT)
Arches National Park

Month	North-South Main Road	Windows Road	Delicate Arch Road	Salt Valley Road	Tower Arch Trailhead Road	Willow Springs Road
January	6,015					
February	6,957					
March	22,167					
April	43,965					
May	63,510	26,147	22,039	522	88	344
June	69,019	23,179	25,021	140	63	343
July	71,987	25,647	26,047	180	50	327
August	80,492	30,472	31,298	220	70	317
September	60,969	27,989	25,324	450	102	400
October	28,961					
November	9,904					
December	4,970					
Total	**468,916**					
Peak season visitation[1]	345,977	133,434	129,729	1,512	373	1,731
Peak season daily average visitors[2]	2,261	872	847	10	3	11
Peak season daily average vehicles[3]	700	270	262	3	1	3
Above X 2 (two-way travel)	1,398[2]	540	525	6[3]	2	6
Seasonally adjusted ADT	1,398	540	525	6	2	6

[1]Peak season visitation = approximately 80% of visitation occurring in May through September.
[2]Peak season visitation / 153 days.
[3]Avg. no. of persons/vehicle = 3.23. This assumes that two vehicles/day will exit park via Salt Valley Road. This figure may be high since some vehicles may exit park while others may travel four-wheel-drive road.

Table D-2: Bus Traffic Volumes
Arches National Park

MONTH	NUMBER OF BUSES
January	1
February	0
March	2
April	12
May	35
June	28
July	26
August	40
September	39
October	14
November	1
December	0
Total	198
Peak season visitation[1]	168
Peak season daily average[2]	1
Above X 2 (two-way travel)	2

[1]Peak season = approximately 80% of total occurring in May through September.
[2]Peak season total / 153 days.

Table D-3: Road System Evaluation
Arches National Park

Rte. No.	Name & Description	Road Segment	Total Length (Miles)	Purpose & Functional Classification	ADT[1]	Road Width (ft)/Surf. Type	Cond.	Terrain[2]	Speed Limit (mph)	Notes
10	North-South Main Road	From US 191 to Devils Garden	17.5	Main park entrance, access to primary park features & developed areas	I 1,398	20 paved	Good to fair	M-R	45	20 MPH for some sections, shoulders breaking off at Whoa Hill
11	Windows Rd	From N-S main road to parking area	2.1	Access to Windows section sightseeing & hiking	II 540	20 paved	Good	R		Dangerous pulloffs through Cove of Caves section
100	Delicate Arch Rd	N-S main road to parking area	2.5	Access to Wolfe Ranch & Delicate Arch, sightseeing	II 525	18 dirt/gravel	Poor	R	20	3 wash crossings subject to flooding at Wolfe Ranch
101	Salt Valley Rd	From N-S main road to west boundary	9.1	Primary access to Tower Arch, part of loop for 4WD travel & primitive entrance/ exit to/from park	II 6	10-16 dirt	Poor	R-F	25	Blackbrush along first 3 miles of road, portion of road located in Salt Valley wash, part of road visible from portions of N-S main road
200	Panorama Viewpoint	From N-S main road to parking area	0.2	Viewpoint	III 200	20 paved	Good to Fair	R		
201	Cache Valley Rd	From Delicate Arch Road to E boundary	0.7	Access to roads outside park	3	8 dirt	Very Poor	R		
203	Tower Arch Trailhead Rd	From Rt. 101 to end of loop	1.0	Access to trailhead	2	9 dirt	Poor	R		Raptor nesting area
204	Viewpoint	From Windows Rd to end of loop	0.2	Viewpoint & walking area	III 160	20 paved	Good	R		
205	Salt Valley Overlook	From N-S main road to end of loop	0.3	Viewpoint	III 200	20 paved	Good	R		

[1]ADT = Average daily traffic (seasonally adjusted)
[2]M = Mountainous, R = Rolling, F = Flat

Rte. No.	Name and Description	Road Segment	Total Length (Miles)	Purpose & Functional Classification	ADT[1]	Road Width (Ft) Surf. Type	Cond.	Terrain[2]	Speed Limit (mph)	Notes
206	Overlook	From N-S main road to end of loop	0.3	Viewpoint	160	20 paved	Good	R		Proposed closure (GMP)
207	Fiery Furnace Parking Access	From N-S main road to end of loop	0.3	Viewpoint & walking areas	III 160	20 paved	Good	R		
208	Devils Garden Campground	From Devils Garden loop rd through campground	0.8	Camping	III 120	20 paved	Fair	R	15	Rehabilitation to be completed soon
209	Klondike Bluffs 4WD Road	N. access rd to Willow Springs Rd	11.3	Primitive driving experience, access to Eye of the Whale & Tower arches	IV 3	8 dirt	Poor-Very Poor	M-R		
210	Tower Arch Rd	Rt. 209 to Tower Arch parking	1.5	Primitive driving experience, access to Tower Arch	IV 3	8 dirt	Very Poor	R		
213	Willow Springs Rd	N-S main road to west boundary	4.0	Primitive driving experience, access to Klondike Bluffs 4WD road & very primitive entrance/ exit to/from park	IV 6	14 dirt				Original entrance road to park
401	Arches Res. Area	Off N-S main road	0.4	Administrative	V 25	20 paved	Fair	F	15	
402	Mixing Table Spur Road	Off Willow Springs Rd	0.1	Administrative	V 5	15 paved	Poor	R		
403	Generator Rd	Rt. 501 to generator	0.2	Administrative	V 5	10 gravel	Fair	F		
500	Windows Loop		0.6	Access to Windows trailhead & parking	III 208	15 paved	Fair	R		One-way road
501	Devils Garden Loop		0.8	Access to campground, trailhead & parking	IV 200	15 paved	Fair	F		One-way road

ISSUES AND SOLUTIONS

Route No. 10 North-South Main Road

Description. This 17.5 mile paved road is the park's main entrance road and provides primary access to the park's major resources and developed areas. The two travel lanes are 10 feet wide for a total paved top width of 20 feet. The shoulders are dirt and range in width from 0 to 3 feet. The first 4.60 miles of road pass through mountainous terrain while the remaining 12.87 miles are in rolling terrain.

There are a number of connector roads and overlooks off this main road. The sub-base and base are generally in good condition on Route 10, however there is substantial surface cracking and, in a few places, the road has poor drainage, resulting either in slumping or sediment washing onto the roadway. There is a 1-mile section at Whoa Hill (between the Panorama Point road and the Delicate Arch road intersections) where total sub-base and base failure has occurred. The shoulders in many places do not really function as such because they are dirt and provide little support. A chip-and-seal project was completed in August 1986.

There are several sections, particularly in the Courthouse Towers, Whoa Hill and Fiery Furnace areas where pullouts and connector road sections do not have proper sight distance from the main park road. In addition, the capacity, siting, and/or design of some pullouts are not appropriate to the volumes and types of vehicles using them. Some of the trails and viewpoints served by pullouts and parking areas are not accessible to handicapped visitors.

Solution. It is recommended that the park's 10-238 Package No. 145 be implemented. The entire length of the north-south main road as well as connector roads and overlooks including Routes 200, 205, 207, 208, 501, and 401 would be rehabilitated and a final 2-inch bituminous surface would be applied. Rehabilitation would correct surface cracking, drainage, and unstable shoulders. Existing and projected traffic volumes and the types of traffic do not warrant widening the roadway. However, as a part of the rehabilitation package, the shoulders should be formalized using a gravel surface. An approximately 1 mile section of Whoa Hill would be reconstructed by scarifying the surface, replacing the sub-base and base, treating the sub-base with lime, adding drainage structures and fill, and applying a 2-inch bituminous surface. The entire road should also be striped and signing updated where necessary. In addition to this package, all pullouts and intersections would be evaluated to determine where improvements would be evaluated to determine where improvements are needed and appropriate design/construction completed. Route 206 (Salt Valley overlook) would be closed. Finally, Route 208 (Devil's Garden campground road) requires intensive drainage work and some camper pad redesign before a 2" final surfacing is applied.

Route No. 11 Windows Road

Description. This 2.1 mile paved road provides access to the Windows section of the park. It is constructed to the same standard (10 ft. travel lanes, 0-3 ft. shoulders) as the north-south main road. This popular area is used for sightseeing and hiking due to the concentration of arches. In addition, the viewpoint (Rt. 204) and the Windows loop (Rt. 500) connect to this road. The sub-base and base are in good condition, however there is substantial surface cracking and, in a few places, there is poor drainage. The shoulders in many places do not really function as such, they are dirt and provide little support. This road was chipped-and-sealed in August 1986.

The section of road near Cove of Caves has a steep uphill/downhill grade and numerous informal pullouts. These informal pullouts are dangerous not only because they are on steep grades, but also because they have no taper into and out of the pullout, and damage to roadside vegetation is occurring.

it is recommended that the park's 10-238, package No. 145 be implemented. This road along with Routes 204 and 500 are a part of the north-south main road package. Improvements would be the

same: rehabilitate at same roadway width, overlay with 2" bituminous final surface, formalize gravel shoulders, and stripe. In addition, shoulder parking and informal pullouts would no longer be allowed; disturbed areas would be revegetated.

Route No. 100 Delicate Arch Road

Description. This 2.6 mile unpaved (partially graveled) road provides access to the Wolfe ranch and Delicate Arch trailhead, and the Delicate Arch viewpoint. Traffic on this road had grown proportionately with overall increases in travel at Arches and, in fact, the road carries as much traffic as the Windows road, which is paved. The route is dusty, washboarded, narrow, winding, and, in some places, poorly drained. Frequent maintenance is required. Delicate Arch viewpoint at the end of the road is the only opportunity to see Delicate Arch for visitors who do not or cannot hike. Buses cannot drive farther than the Wolfe ranch because of the stream level crossing at Salt Valley Wash. This precludes most people on tours, including many senior citizens, from seeing the most publicized arch in the park. Once visitors in standard vehicles enter the parking area at the viewpoint, their cars can be seen by hikers who have reached Delicate Arch, thereby detracting from the impressive natural scene.

Another issue is flooding. Near the Wolfe ranch, the road crosses three washes – Salt Valley, Salt, and Winter Camp. All drain large areas, converge just below the ranch, and have flash floods. For six weeks in the summer of 1984, the road was closed because of washouts and mud. Visitors have been stranded in their vehicles. A new road crossing for Salt Valley Wash to be designed by the Federal Highway Administration (FHWA) has been deferred from 1986 to 1988. However, FHWA has recently completed a hydraulics study which will precede the design/construction project. A floodplain determination is necessary before any design and construction of bridges can begin at the Salt and Winter Camp washes.

Solution. The Delicate Arch road would be paved, and three bridges would be constructed across the washes to facilitate access to the Wolfe ranch and the Delicate Arch viewpoint. These actions would prevent road closures due to flooding and reduce maintenance. The existing alignment would be maintained as much a possible and built to the same width standard as the north-south main road and the Windows road. It would be designed at a 25 mph standard, thereby minimizing cut and fill and retaining a quality driving experience.

Route No. 101 Salt Valley Road and Route No. 203

Description. This grade road, beginning near Devils Garden and exiting the park 9.1 miles northwest at the head of Salt Valley leads to Klondike Bluffs and the Tower Arch trailhead. It provides the only unpaved two-wheel-driving experience in the park other than the Delicate Arch road. Route 203, the Tower Arch trailhead road, leads from the Salt Valley road 1 mile to the trailhead. Road conditions and weather permitting, these routes are accessible by automobile. A few visitors may leave the park via the Salt Valley road and drive the remaining 10 miles to highway 191, and others with four-wheel-drive vehicles use this as part of a loop drive. Relatively few visitors – perhaps only one percent – travel here compared to other sections of the park. For about 2 miles, Route 101 is in the channel of Salt Valley wash. Washouts occur here, and vehicles could be damaged and/or stranded. Overall the road is narrow, washboarded in areas, dusty, poorly drained, and recessed well below ground level in many places.

Solution. It is recommended that both roads be maintained at their existing standard. Established use patterns show that this level of maintenance is appropriate and no major improvements are necessary.

Four-Wheel-Drive-Roads -- Route Nos. 209, 210, and 213

Description. There are three primitive roads in Arches, two starting near Balanced Rock picnic area. One, the original monument entrance road, leads east 4 miles where it exits the park near Willow Spring. The second is the 11.3 mile Klondike Bluffs four-wheel-drive road which leads northwest and ends at the Salt Valley road. The third road is a spur on the Klondike Bluffs four-wheel-drive road which proceeds 1.5 miles to a trailhead near Tower Arch.

These roads provide the only true primitive driving experiences in the park.

Solution. It is recommended that these roads be managed as primitive four-wheel-drive roads with little or no maintenance required.

Administrative Roads – Route Nos. 402 and 403

Description and Solution. The generator road (Route 403) should be maintained as needed and continue to function as an administrative road. The mixing table would be relocated outside the park.

APPENDIX C: TRAIL STANDARDS

CLASS A TRAILS (ALL-VISITOR ACCESSIBLE)

These trails have the highest maintenance standards and first maintenance priority. Class A trails are constructed and maintained for highly concentrated visitor use by visitors of all abilities, including those restricted to wheelchairs. These trails normally provide access to major visitor attractions. The surfaces are of smooth cement, asphalt, or soil cement, and they contain major structural elements such as bridges, wooden walkways, metal culverts, puncheons, drainage aids, railings, steps, mortared or dry rock retaining walls, etc. No cross-trail drainage structures except broad channel dips are allowed. Minimum tread width for this class of trail is 5 feet to accommodate wheelchairs; maximum width will be as visitor use dictates. Vegetation is cleared 1-1/2 feet beyond the tread margin.

CLASS B TRAILS (PRIMARY)

Class B trails are improved and maintained for heavy visitor use by visitors of average physical abilities. These trails normally provide access to major visitor attractions. They are highly developed and contain some structural elements such as bridges, metal culverts, puncheons, drainage aids, railings, steps, mortared or dry rock retaining walls, etc., to maintain uniformly high trail standards. Trail tread is maintained at a high standard for convenience and comfort, utilizing nonnative aggregate wherever native soils prove inadequate to sustain heavy visitor use. The tread is uniformly smooth and free of variations and rock and root protrusions, and composed of fines no larger than 1 inch in diameter. Slickrock tread may have natural variations. Minimum tread width is 24 inches; maximum width will be as visitor use dictates. Vegetation is cleared 1 foot beyond the tread margin.

CLASS C TRAILS (SECONDARY)

Class C trails are maintained for heavy to moderate use by inexperienced visitors of intermediate ability. These trails reach important visitor attractions and provide access to other trails. The trail tread and structural elements such as water bars, rock culverts, rock steps, retaining walls, etc., are made with native materials as a general rule, although such structures as ladders and handrails may be made of other material where deemed necessary for visitor safety. The trail tread is relatively smooth and free of extreme variations and abrupt rock and root protrusions higher than 2 inches. Slickrock tread may have natural variations. Minimum tread with is 18 inches; maximum width is 24 inches, except for short sections along a precipice, steep hillside, or other hazardous areas where wider treads may be necessary to provide for user safety. Short sections of the trail may be cairns over slickrock or along wash bottoms, etc. Vegetation is cleared 6 inches beyond the tread margin.

CLASS D TRAILS (SEMIPRIMITIVE)

Class D trails are maintained for moderate to light use by visitors of intermediate to high ability and experience. Trail development is limited to the minimum necessary to maintain trail tread and visitor safety. The tread may have moderate variations and abrupt rock or root protrusions higher than 2 inches but lower than 8 inches. The tread is composed of native materials only. As a general rule, structural work such as water bars and short retaining walls are constructed of local native material, although ladders may be made of other materials where deemed necessary for visitor safety. The trail tread width is maintained at an 18-inch minimum/maximum width, except for sections along precipices, steep hillsides, and other hazardous areas where wider treads may be necessary to provide for visitor safety. Long sections of the trail may be cairns over slickrock or along wash bottoms, etc. Vegetation is cleared to the edge of the tread margin.

CLASS E TRAILS (PRIMITIVE)

Class E trails are maintained as primitive marked routes for light use by visitors with wilderness experience ability. No tread is established or maintained and no structural work is attempted. These trails require minimal maintenance such as minor brushing and rock cairns where necessary to establish the route and provide for visitor safety.

APPENDIX D: VISITOR CENTER FUNCTIONS AND SIZE REQUIREMENTS

FUNCTIONS

The primary function of the proposed visitor center will be information and orientation. In-depth interpretation will be on site. The visitor center will contain the following:

Entryway panels: Panels accessible on a 24-hour basis will provide basic information, orientation, park brochures, emergency instructions, and regulations.

Lobby:

Information desk – NPS personnel will provide information and assistance.

Trip planning – The objective will be to make very clear the options and amount of time and effort needed to see each combination of features, and the different standards and modes of access involved. Travel selection exhibits will cover primarily Arches National Park. Canyonlands National Park will be covered to the extent of letting visitors know what the park has to offer, how that contrasts with Arches, and where to go to receive in-depth trip planning assistance.

Geographic orientation – A fairly large single-relief model of Arches National Park will orient visitors to the park's geographic features.

Regional orientation (optional) – A graphic covering either the Colorado Plateau or the Four Corners area will show the other recreational opportunities in the region.

Safety/survival exhibit – A highly visible exhibit will introduce visitors to the principles of safe and resource-conscious backcountry travel in desert country. The exhibit will deal with water, heat/cold, walking and climbing on slickrock, using maps, discomforts and hazards, etc.

Cooperating association sales: The cooperating association will occupy a separate area with its own sales desk and personnel. The sales area will be located where it does not interfere with the information desk functions but close enough that the information desk/sales functions can be jointly operated in the off season. Storage will be limited to immediate sales stock needs.

Exhibit room: The visitor center is not intended to be an object-rich or in-depth museum. Exhibits will be designed to give visitors an overview of park resources and to motivate them to explore the resources first-hand. The two most important topics to cover are regional geology and erosional landforms.

Interpretation of regional geology will deal with rock layers, uplift, collapse, and erosion along folds, faults, and collapsed salt intrusions. This might be handled using a combination of exhibits and audiovisual media, possibly utilizing computer-generated or animated images.

Interpretation of erosional landforms will deal specifically with the geomorphic varieties and examples of different surface features – five kinds of arches, fins, needles, etc. This topic could be handled by artwork.

If space and funding permit, the ecosystem theme could be covered. This theme is interpreted in several plateau parks and the literature covers it well, so it is an optional topic.

Audiovisual/auditorium: The program could take a mood-setting approach using visual imagery and minimal narrative, or it could take an informative approach and describe the regional geology – or both might be developed and shown on an alternating basis. The auditorium will seat 120 people.

Restrooms: Restrooms will be accessible from outside the building on a 24-hour basis.

Offices (including storage space): Office and related operational space will be provided for visitor center staff.

SIZE

The estimated space required for the proposed visitor center is 9,000 square feet. This estimate is based on a projection of visitor use derived from the following assumptions (the same rationale used to determine parking needs):

The average one-time capacity in the existing visitor center for 1987 was 220 visitors (based on observations of a an average of 22 vehicles, 7 RVs, and 2 buses in the visitor center parking lot at any one time).

There will be a 36% increase in visitation by the year 2006.

Therefore, the average one-time capacity in 2006 will be 300 visitors.

The building size was determined by using the following general NPS minimal space allowance standards:

Lobby (includes sales area)	20 square feet per person
Exhibit room	20 square feet per person
Auditorium	11 square feet per person

The above visitor spaces averaged 17 square feet per person; therefore, 5,100 square feet were estimated for 300 people. In addition, 700 square feet were allocated for restrooms and 1,100 square feet to provide offices and workspace for a staff of ten. This totaled 6,800 square feet. To provide for mechanical space, walls, etc., another 33 percent was added, resulting in 9,000 square feet.

APPENDIX E: WORK TO BE PERFORMED BY ADDITIONAL STAFF

Division of Management and Administration

Superintendent GS 12 FTE 1.0 (Grade Increase Only)	To provide supervision and management for Arches National Park, which had over 460,000 visits in 1987. Arches has experienced an average annual increase in FTE visitation of 11% over the five years ending in 1987. The plan anticipates a budget of $668,100 (1988 dollars) in personnel expenditures, and a FTE of 31.4. This position provides direct supervision to two GS-11s, one GS 05, and one GS 04.
Clerk Typist GS 04 FTE 1.0	To provide clerical assistance for fee collection (Arches National Park collected $386,000 in 1987), time keeping, and the Maintenance Management System.

Division of Interpretation

Chief of Interpretation GS 11 FTE 1.0 (Grade Increase Only)	To provide management for the public information program, which includes 11 presentations per day plus visitor center services for Arches National Park, Canyonlands National Park, and Natural Bridges National Monument. In the preferred alternative, this position would provide direct supervision to 8.6 FTEs and be responsible for a budget of about $170,000.
Park Ranger GS 05/07/09 FTE 1.0 (Grade Increase Only)	The proposed change in grading of this position is intended to allow for upward mobility. The position is designed to allow for the assumption of increased responsibility in assisting with the management of the division. At the full performance level, this individual will assume responsibility for the supervision of most of the field interpretive operation.
Park Ranger (Lead Seasonal) GS 06 FTE 0.7	This position would have a lead roll in the presentation and organization of the summer program. Assistance would be provided to permanent staff in several areas, including the auditing of programs, training of other staff, evaluation of the needs and content of interpretive programs, scheduling, and presentation of guided walks and evening programs.
Park Ranger (Perm. Part-Time) GS 05 FTE 0.8	Position would be responsible for the management of various park collections and archives including all museum storage/collection facilities, library, historical files, photo files, and herbarium. Duties would also include curatorial services for the above collections.
Park Ranger (Seasonal) GS 05 FTE 2.1	Personnel to be used to lead additional tours and increase visitor center desk operations. These positions would eliminate the need to depend on the assistance of the Student Conservation Aid program for key operations.

Park Ranger (Seasonal) GS 05 FTE 0.7	This additional position would allow a visitor center operation of 8:00 a.m. to 6:00 p.m. (March-October). The position would also allow an increase in the frequency and length of guided walks, and a decrease in the dependence on student conservation aids for key interpretive services.
	Division of Resource Management and Visitor Protection
Chief Ranger GS-11 FTE 1.0 (Grade Increase Only)	To provide management for the division. Responsibilities include law enforcement, fee collection, fire management, medical, resource management, campground operations, and monitoring several budgets totaling about $190,000.
Park Ranger GS 05/07/09 FTE 1.0 (Grade Increase Only)	The proposed change in grades is intended to allow for upward mobility. The position is designed to provide opportunities for increased responsibilities in management of the division. At the full performance level, this position would assume responsibility for the supervision of most field protection and resource management operations.
Park Ranger (Perm. Part-Time) GS 05 FTE 0.8	Position would allow for increased patrols in the front and back countries with coverage from 6:00 a.m. to 12 midnight. Coverage for search and rescue and other emergency situations would also be facilitated. Resource management duties would include revegetation, tamarisk eradication, raptor monitoring, breeding bird surveys, banding eagles and hawks, and graffiti removal.
Park Ranger (Seasonal) GS 05 FTE 1.1	Duties for these positions would be identical to those listed above for park ranger GS 05 (permanent part-time).
Park Ranger (Seasonal) GS 05 FTE 0.7	Position is required for resource management tasks. Responsibilities would include revegetation, tamarisk eradication, breeding bird surveys, raptor monitoring, banding eagles and hawks, and graffiti removal.
Park Ranger (Seasonal) GS 03 FTE 1.4	Positions are required to perform fee collection duties. Responsibilities include working as a cashier at entrance station and completing shift, deposit, and remittance reports. Increased hours for fee collection would be facilitated.
	Division of Maintenance
Maintenance Mechanic (Seasonal) WG 09 FTE 1.5	Journeyman plumber/carpenters are needed to perform scheduled and emergency maintenance on park water systems, including all septic systems, plumbing fixtures, and reservoirs, plus systems in personnel quarters, visitor center, and Devils Garden campground. Other plumbing responsibilities include the winterization and dewinterization of seasonal buildings, collection of water samples, and maintenance of the chlorination system. Carpentry duties will include the construction of traffic control devices and routed wood trail and road signs, as well as general building maintenance.

Maintenance Worker WG 06 FTE 1.0	Position would implement a preventative maintenance program on park septic systems, (including operation of the park's sewage pumper), make minor repairs to personnel quarters and other facilities, and assist with more technical repairs. Other duties would include the collection and disposal of solid waste from quarters and visitor center; the maintenance of grounds around park buildings; and the collection of data from and monitoring of the park air quality station.
Maintenance Worker Leader (Seasonal) WG 05 FTE 0.5	Position would be responsible for scheduled trail maintenance at the La Sal viewpoint, Courthouse Towers, Moab rock art panel, Windows, Balanced Rock, Delicate Arch, Fiery Furnace, and Sand Dune Arch.
Maintenance Worker (Seasonal) WG 05 FTE 0.5	Position would to assist WG-05 with trail duties.
Maintenance Worker (Seasonal) WG 03 FTE 0.5	Position would assist with grounds care and solid waste removal from quarters and administrative areas. Assistance would also be provided in pumping vault toilets, trail maintenance, and other related work.
Maintenance Worker (Seasonal) WG 03 FTE 0.5	Position would perform custodial duties at the visitor center and surrounding grounds, and assist with trail maintenance.
Maintenance Worker (Seasonal) WG 03 FTE 0.3	Position would assist with litter removal and custodial duties at the Devils Garden campground, the Wolfe ranch, Balanced Rock, Sand Dune Arch, and the Devils Garden trailhead. Assistance would also be provided to trail maintenance.

APPENDIX F: STATEMENT OF FINDINGS FOR FLOODPLAINS

INTRODUCTION

Two existing developed areas in Arches National Park are in floodplains. These are the park headquarters/visitor center area expanded in about 1960 next to Bloody Mary Wash and the Wolfe Ranch parking area built near the historic Wolfe Ranch adjacent to Salt Wash.

The National Park Service considered a range of alternatives in the general management plan to avoid or mitigate the adverse impacts associated with occupation of floodplains, in accordance with the National Park Service final regulations for implementing executive orders 11988 and 11990 (45 FR 35916, as amended August 23, 1982 by FR 36718). There are no applicable State of Utah or Grand County regulations regarding occupation of floodplains.

The alternative selected as the general management plan is the most practicable solution for mitigating the flood hazards and protecting beneficial floodplain values at both sites.

No wetlands would be affected by the plan.

HEADQUARTERS

Affected Environment

The headquarters area lies between Bloody Mary Wash and sandstone slickrock slopes to the north. Bloody Mary Wash is an intermittent stream and does not support a fish population. The headquarters area has sandy soils that support a shrub-grassland plant community of Indian ricegrass, needle-and-thread grass, cheatgrass, old-man sage, Mormon tea, and rabbitbrush.

Why Development/Actions Are Located In The Floodplain

The existing development at headquarters, including the access road across Bloody Mary Wash, was constructed long before floodplain studies were conducted for the area. After flood studies were completed in 1986, it became apparent that all the development, except for the three residences on a rock outcrop near the maintenance area, is within either the 100-year, 500-year, or probable maximum floodplain (PMF). The flood studies also indicated the PMF zone is susceptible to flash flooding. There is little area feasible for building on higher ground at headquarters that is not in a floodplain. Existing utility lines and leach fields are within the floodplain because there was no practicable alternative; lines could not be located north of the buildings because of the rocky terrain and thin soil. Early planning studies determined the best location for the new Arches visitor center is the headquarters area. The site for the new visitor center was selected on the condition that it could be protected from flooding using acceptable mitigation measures.

Alternatives Considered

A review of alternatives to avoid or mitigate the adverse impacts of human occupation of floodplains was undertaken by the staff of Arches National Park, the Rocky Mountain Regional Office, and the Denver Service Center of the National Park Service. The final general management plan utilizes a combination of structural modification of roads and buildings, location of new buildings outside the 500-year floodplain, and installing a flood alarm system to mitigate these adverse impacts. A brief discussion of floodplain alternatives follows.

General Management Plan. Actions include construction of a new visitor center building above the 100-year floodplain. Wastewater from the new visitor center would be pumped to a new sewage treatment facility below the maintenance area. The treated wastewater would be disposed of in a leach field in the 100-year floodplain east of the maintenance area more than 1,000 feet from the existing water well. A new building to house the museum collection and archival material will be constructed above the probable maximum floodplain. Structural floodproofing at the maintenance building will protect hazardous materials, the fuel tanks, and the water treatment facility from a 500-year flood.

The park entrance road will be modified to mitigate effects of a 100-year flood on residence #3; 500-year flood on the existing library and apartment buildings; and the probable maximum flood (PMF) on the proposed visitor center and existing administrative building. Two additional culverts will be installed under

the road just north of the existing culvert to increase the hydraulic capacity of Bloody Mary Wash. This will reduce ponding by the existing limited-capacity culvert and road embankment and help restore more natural stream flow during floods. About 1,600 feet of the main entrance road and spur road leading to the maintenance yard road will be raised an average of four feet to protect the housing area from flooding. A State of Utah stream channel alteration permit will be required to place road fill in the floodplain and to alter the culverts. This permit will be obtained from the Utah Department of Natural Resources, Water Rights Division. The U.S. Army Corps of Engineers, Salt Lake City Office, was consulted and a section 404 permit will not be necessary.

With the modifications described above, all areas where visitors congregate and where staff live, and all developed sites west of the main crossing of Bloody Mary Wash, will then be outside the 500-year floodplain. Current floodplain data is based on existing conditions, including the existing road and culvert locations. Throughout the headquarters area, some facilities may remain in the PMF zone, and would be susceptible to flash-flooding. If these facilities are impacted by a PMF event, the modifications of the road and culverts would greatly reduce the severity of flash flooding on structures and areas where people congregate, and such areas would be in backwater areas out of high velocity flows. Although protection against the PMF is preferred for flash-flood prone areas, it would require such extreme berming or raising of the road surface that an adverse visual effect would result. To mitigate remaining flood hazard, the feasibility of a flood warning system will be determined, and, subsequently, an emergency flood response and evacuation plan will be prepared to warn visitors and staff throughout the headquarters area of an approaching flood. Alarms will be placed in all structures within the PMF zone, including the visitor center, administration building, natural history association office, residence #3, the apartment building, and the maintenance building. No new facilities will be constructed in the headquarters area until after the feasibility of a warning system has been proven. If a warning system is not feasible (in consideration of the required warning time for adequate response/evacuation), then no new facilities will be constructed and other alternatives will be considered.

To further protect the developed area from sheet flooding of the slickrock slopes to the north, the existing drainage channel just north of the new visitor center will be widened, deepened, and stabilized, and the berm on the downhill side of the channel will be raised two feet. Further structural modification to protect headquarters from a 500-year flood or runoff coming from the slickrock is not considered feasible because of the adverse visual effects.

No-Action Alternative. Under no-action, use of existing structures would continue. The ponding of floodwater caused by the entrance road and culvert would still exist during flooding of Bloody Mary Wash. The park entrance road would continue to be susceptible to damage from flooding. Residence #3 would remain in the 100-year flood zone, perpetuating hazardous conditions for the occupants. The employee apartment building and the library building would remain in the 500-year floodplain. The existing critical actions of storing museum and archival material and storing fuel and toxic substances in the 500-year floodplain would continue, as would the potential for loss of irreplaceable documents and contamination of floodwaters.

Minimum Requirements Alternative. Under this alternative, compliance with floodplain regulations would be met by removing the apartment building, residence #3, and the museum collections from the 500-year floodplain. Fuel and toxic material storage at the maintenance area would be floodproofed. The library building (with the museum collection and archival material removed from the park) and the maintenance area would remain vulnerable to a 500-year flood. The visitor center/administrative building and natural history association offices would remain vulnerable to the PMF. No alarm system would be installed to warn visitors congregating at the visitor center in the event of a flash flood. The entrance road and culvert would remain vulnerable to flood damage, with temporary closure of the park a possible consequence.

Alternatives Considered But Rejected

Designing total protection from the PMF was considered. To protect all people and all development from any possibility of flooding, a $1.5 million bridge across Bloody Mary Wash would be necessary, in addition to raising the entrance road 4 to 8 feet along most of its length. Because of the high cost and environmental and visual impact, this option was not selected.

Relocating all headquarters development out of the park was considered. This option was rejected because of inefficiency of operating the park from the nearest area available in the Moab vicinity and an estimated

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cost of at least $4 million for removing existing facilities and reconstructing and leasing (15-year) new facilities.

Relocating the apartment building, residence #3, and the maintenance complex elsewhere in the near vicinity was considered. This option was rejected because there are no feasible locations for these structures due to the lack of suitable building areas outside the floodplain. Relocating headquarters elsewhere in the park is not feasible because of impacts on the park's natural terrain and an estimated cost of at least $7 million to rebuild facilities and utilities.

Floodproofing the maintenance area was considered by raising the access road approximately 3-4 feet by constructing a 3-4-foot berm to just east of maintenance complex. This option was not selected because raising the road or berming would impede drainage in case of sheet flooding from adjacent slickrock slopes, resulting in ponding on the north side of the road.

WOLFE RANCH

Affected Environment

The Wolfe Ranch area is next to Salt Wash and near the confluence of Winter Camp Wash and Salt Valley washes. Saline, alkaline soils support a shrub community of saltbush, snakeweed, and non-native Russian thistle and cheatgrass.

Why Development/Actions Are Located In The Floodplain

The cabin and corral were historically constructed close to the channel of Salt Wash and remain in their original locations. The trailhead parking area was constructed long before flood studies were conducted. Although no floodplain determination has been completed, the ranch has flooded several times during the past 50 years. The parking area is most likely in the 100-year floodplain and may be in the 500-year floodplain. Other potential locations for parking in the area are in higher velocity flood zones. The stream crossings along the main road near the ranch are stream-grade crossings that periodically wash out. The Federal Highway Administration will replace the stream crossings in 1990 to avoid washouts and road closures. Parking areas and access roads are excepted actions from floodplain protection regulations; however, areas where visitors congregate should not be located in high hazard flash flood areas without adequate signs or warning systems.

Alternatives Considered

General Management Plan. The existing parking area will be expanded to the northwest. The drainage ditch along the edge of the existing parking lot will be relocated so as to carry downslope runoff around the edge of the new parking area. New flood-proof vault toilets will be located out of high velocity flood areas. Signs and interpretive information will direct visitors to climb nearby slopes to high ground in the event of flash flooding. A floodplain study of this hydrologically complex area will be completed on a high priority basis.

No-Action Alternative. The existing parking area would continue to be used, with occasional closure when the access road floods or is damaged. There would be little risk to personal safety because most visitors would climb to nearby high ground. The existing pit toilet would continue to be used, with likely contamination of surface water in the event of a flood.

Minimum Requirements Alternative. Use of the existing parking area would continue. A floodplain study would be completed as under the general management plan.

Alternatives Considered But Rejected

Relocating the parking area and trailhead south of the Delicate Arch road or east of Salt Wash was considered. These two options were rejected because these areas would expose visitors to a higher risk (these areas are in higher velocity flood zones than in the existing parking area).

Relocating the parking area and trailhead east of Winter Camp Wash was also considered. This option was rejected because it would require visitors to walk 900 feet farther to reach Wolfe Ranch and because some visitors may park closer along the roadway.

EFFECT ON NATURAL OR BENEFICIAL FLOODPLAIN VALUES

None of the proposals at developed sites would adversely affect the water resource values of floodplains related to the natural moderation of floodwaters, maintenance of water quality, and groundwater recharge. No living resource values would be affected. The natural and beneficial values of floodplains or wetlands will not be adversely affected (see "Environmental Consequences" section of the draft environmental assessment). Actions would benefit the natural and beneficial values of the floodplains by reducing the risk of contamination of floodwaters by toxic material, stored fuel, or untreated sewage wastewater. Short-term disruption of vegetation and soil by construction activities would not increase the potential for erosion or downstream siltation in the event of normal storms.

CONCLUSION

Based on the proposed actions and mitigating measures described above, the National Park Service has determined that the preferred alternatives for the headquarters and Wolfe Ranch areas are the most practicable alternatives. This decision was based on the need to provide adequate visitor and administrative facilities, to improve visitor experience and safety, and to improve resource protection. The risk to human safety will be minimized by provision of flood emergency warning and response planning for headquarters, and flash-flood warning signs at Wolfe Ranch. There will be no adverse effect on the natural or beneficial values of floodplains or wetlands at headquarters or Wolfe Ranch, and potential impacts will be removed.

Recommended: Lorraine Mintzmyer — 7-18-89

Regional Director, Rocky Mountain Region — Date

Approved by July 13, 1989, memorandum from Chief, Water Resources Division, Washington Office to Associate Regional Director, Planning and Resource Preservation, Rocky Mountain Region

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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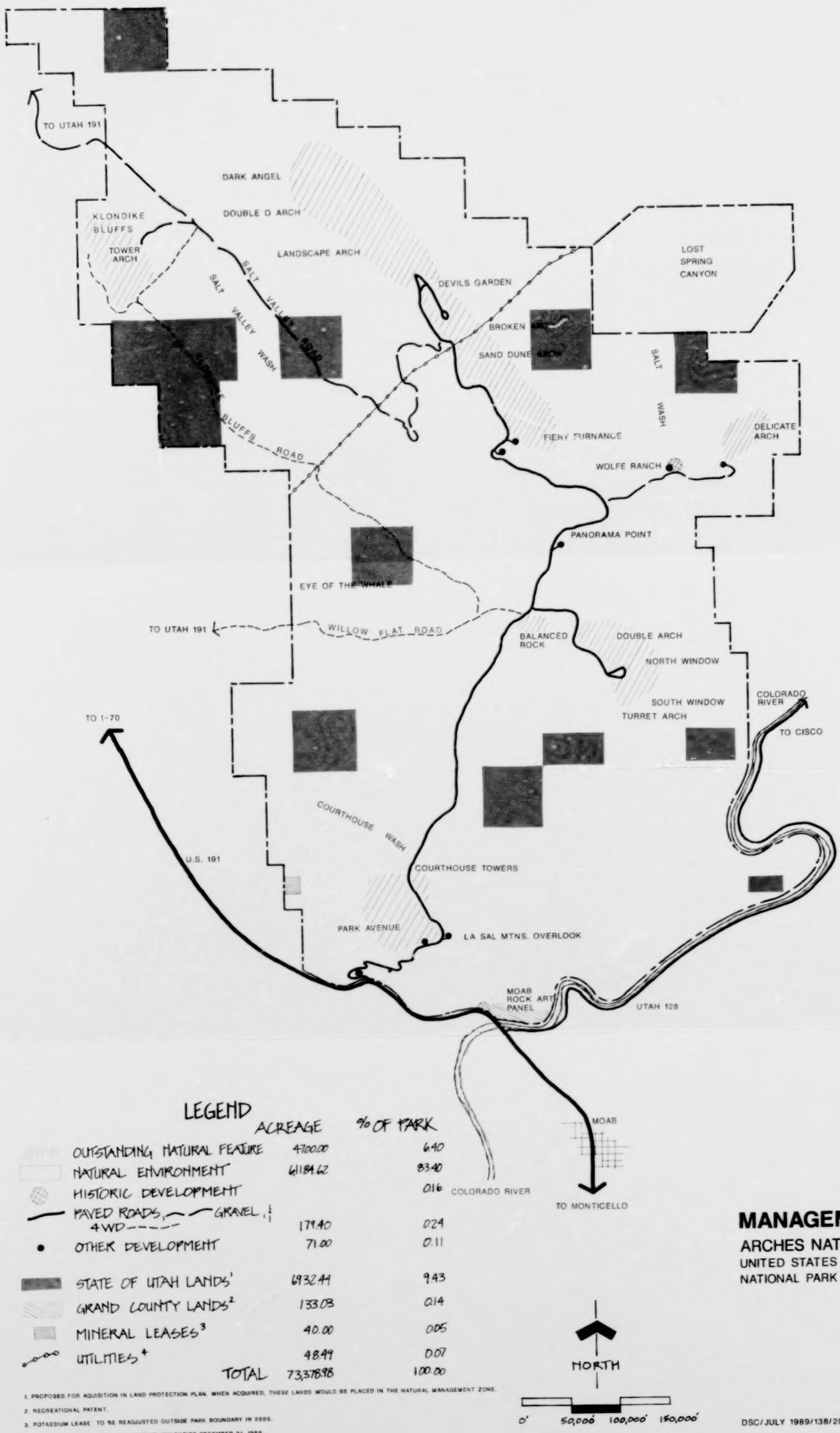


LEGEND

	ACREAGE	% OF PARK
OUTSTANDING NATURAL FEATURE	4700.00	6.40
NATURAL ENVIRONMENT	61184.62	83.40
HISTORIC DEVELOPMENT		016
PAVED ROADS, GRAVEL, 4WD	179.40	024
OTHER DEVELOPMENT	71.00	0.11
STATE OF UTAH LANDS[1]	6932.44	9.43
GRAND COUNTY LANDS[2]	133.03	014
MINERAL LEASES[3]	40.00	005
UTILITIES[4]	48.49	0.07
TOTAL	73378.98	100.00

1. PROPOSED FOR AQUISITION IN LAND PROTECTION PLAN. WHEN ACQUIRED, THESE LANDS WOULD BE PLACED IN THE NATURAL MANAGEMENT ZONE.
2. RECREATIONAL PATENT.
3. POTASSIUM LEASE TO BE READJUSTED OUTSIDE PARK BOUNDARY IN 2005.
4. GAS PIPELINE BY SPECIAL USE PERMIT WILLEXPIRE DECEMBER 31, 1989.

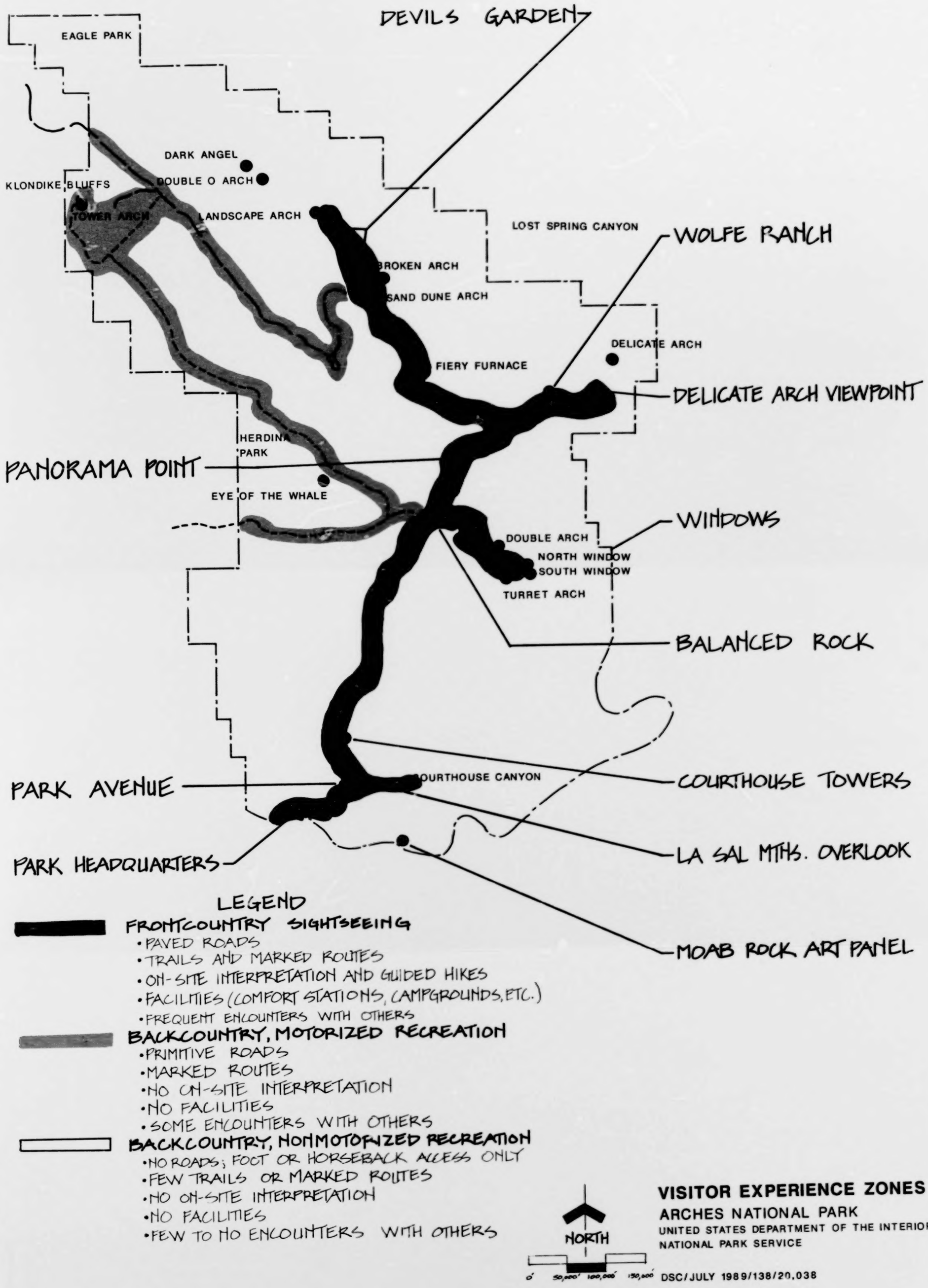
NORTH

0' 50,000' 100,000' 150,000'

MANAGEMENT ZONES

ARCHES NATIONAL PARK
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20.039



VISITOR EXPERIENCE ZONES

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,038

DEVILS GARDEN
•EXPAND EXISTING TRAILHEAD PARKING, ADD TURNAROUND LANE
•ADD TRAILHEAD EXHIBIT ¦ COMFORT STATION
•ADD 10 WALK-IN TENT CAMPING SITES
•REDESIGN AMPHITHEATER
•ADD DUMP STATION
•ADD NEW RANGER RESIDENCE ¦ OFFICE
•REDESIGN UTILITY SYSTEM
•LIMIT SIZE ¦ USES OF MAINTENANCE AREA
SAND DUNE ARCH
•EXPAND TRAILHEAD PARKING IN ADJACENT, OFF-ROAD SITE
•ADD TRAILHEAD EXHIBIT FOR TRAIL TO ARCHES AND LOST SPRING CANYON
EXPAND NATIONAL PARK BOUNDARY TO INCLUDE LOST SPRING CANYON IF BLM WILDERNESS AREA NOT ESTABLISHED
WOLFE RANCH
•EXPAND ¦ PAVE EXISTING PARKING
•ADD HANDICAP ACCESSIBLE VAULT TOILETS IN NEW LOCATION
•ADD EXHIBITS AT TRAILHEAD ¦ RANCH
•PROVIDE PROTECTION FOR PETROGLYPHS, FORMALIZE TRAIL
•PAVE DELICATE ARCH ROAD ¦ CONSTRUCT BRIDGES OVER WASHES
DELICATE ARCH VIEWPOINT
•DEVELOP NEW PARKING AREA HIDDEN FROM VIEW FROM DELICATE ARCH
•EMPHASIZE INTERPRETATION AT NEW VIEWPOINT
•REDESIGN EXISTING VIEWPOINT PARKING TO SERVE AS TRAILHEAD
REMOVE FROM USE EXISTING SALT VALLEY OVERLOOK. REMOVE ROAD AND PARKING AREAS. REVEGETATE AREA.
PANORAMA POINT
•ADD HANDICAP ACCESSIBLE VIEWPOINT WITH EXHIBIT
REDUCE SIZE ¦ LIMIT USES OF MAINTENANCE STORAGE AREA
WINDOWS
•DEVELOP HANDICAP ACCESSIBLE PICNIC AREA, PARKING, COMFORT STATION, ¦ TRAIL TO DOUBLE ARCH
•ADD PERIMETER TRAIL
•ADD EXHIBITS AT UPPER ¦ LOWER TRAILHEADS
BALANCED ROCK
•EXPAND PARKING IN ADJACENT, OFF ROAD SITE
•RELOCATE VIEWPOINT ¦ MAKE MAKE HANDICAP ACCESSIBLE
•RELOCATE PICNIC AREA
•ADD CROSSWALK ¦ SIGNS ON MAIN ROAD
•ADD EXHIBIT
COURTHOUSE TOWERS
•REVISE EXHIBIT
•ADD CROSSWALK ¦ SIGNS ON MAIN ROAD
PARK AVENUE
•IMPROVE HANDICAP ACCESSIBILITY
•REVISE EXHIBIT
LA SAL MTNS. OVERLOOK
•MAKE VIEWPOINT HANDICAP ACCESSIBLE
•REVISE VIEWPOINT EXHIBIT
•DEVELOP PRIMITIVE ROUTE TO COURTHOUSE WASH ¦ ADD EXHIBIT
PARK HEADQUARTERS
•ADD NEW VISITOR CENTER
•CONVERT EXISTING VISITOR CENTER TO OFFICES
•MITIGATE FLOOD HAZARD THROUGH DESIGN
•REDESIGN SEWAGE TREATMENT SYSTEM
•ESTABLISH COMMON ARCHITECTURAL MOTIF
MOAB ROCK ART PANEL
•ADD INTERPRETIVE EXHIBIT ¦ PROTECTIVE BARRIER
•ADD TRAIL TO PANEL IF FORMAL PARKING ¦ CROSSWALK PROVIDED BY UTAH DEPT. OF TRANSPORTATION
RESET PARK BOUNDARY TO NORTH SIDE OF RIGHT-OF-WAY OF NEW HIGHWAY IN MOAB CANYON
REVISE EXHIBIT AT MOAB FAULT OVERLOOK
TO UTAH 191
DARK ANGEL
DOUBLE O ARCH
LANDSCAPE ARCH
KLONDIKE BLUFFS
TOWER ARCH
SALT VALLEY ROAD
SALT VALLEY WASH
KLONDIKE BLUFFS ROAD
DEVILS GARDEN
BROKEN ARCH
SAND DUNE ARCH
FIERY FURNACE
LOST SPRING CANYON
SALT WASH
DELICATE ARCH
WOLFE RANCH
PANORAMA POINT
EYE OF THE WHALE
WILLOW FLAT ROAD
TO UTAH 191
BALANCED ROCK
DOUBLE ARCH
NORTH WINDOW
SOUTH WINDOW
TURRET ARCH
COLORADO RIVER
TO CISCO
TO I-70
U.S. 191
COURTHOUSE WASH
COURTHOUSE TOWERS
PARK AVENUE
LA SAL MTNS. OVERLOOK
MOAB ROCK ART PANEL
UTAH 128
MOAB
COLORADO RIVER
TO MONTICELLO
LEGEND
ARCHES NATIONAL PARK BOUNDARY
NPS RECOMMENDATION FOR EXPANDED PARK BOUNDARY
BLM WILDERNESS STUDY AREA BOUNDARY
NATURAL FEATURE
PARKING AND/OR TRAILHEAD
PAVED ROAD
GRAVEL ROAD
FOUR-WHEEL-DRIVE ROAD
TRAIL
NORTH
0'
50,000'
100,000'
150,000'

PROPOSED DEVELOPMENT

ARCHES NATIONAL PARK
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

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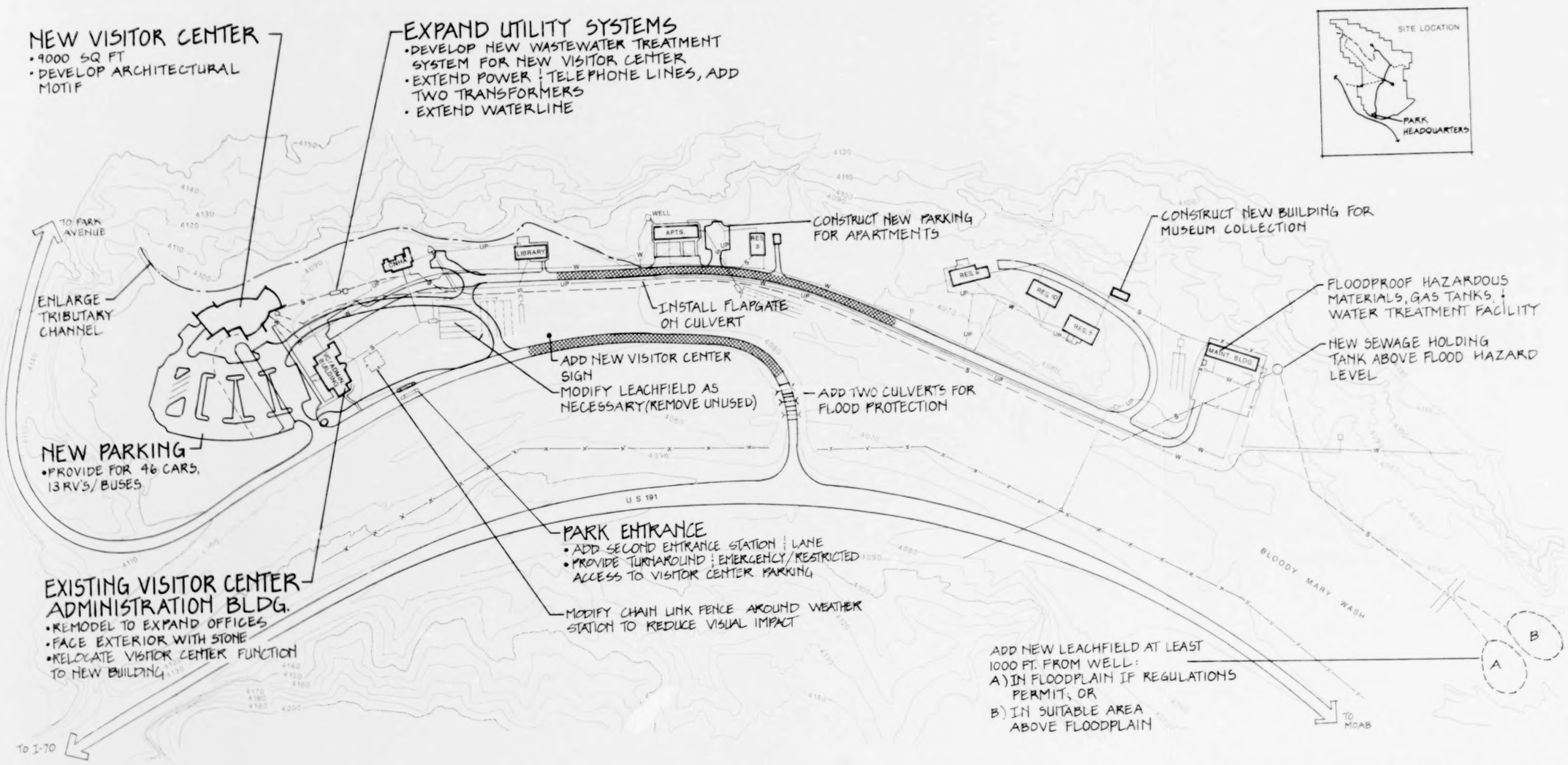

DEVELOPMENT CONCEPT PLAN

PARK HEADQUARTERS

ARCHES NATIONAL PARK

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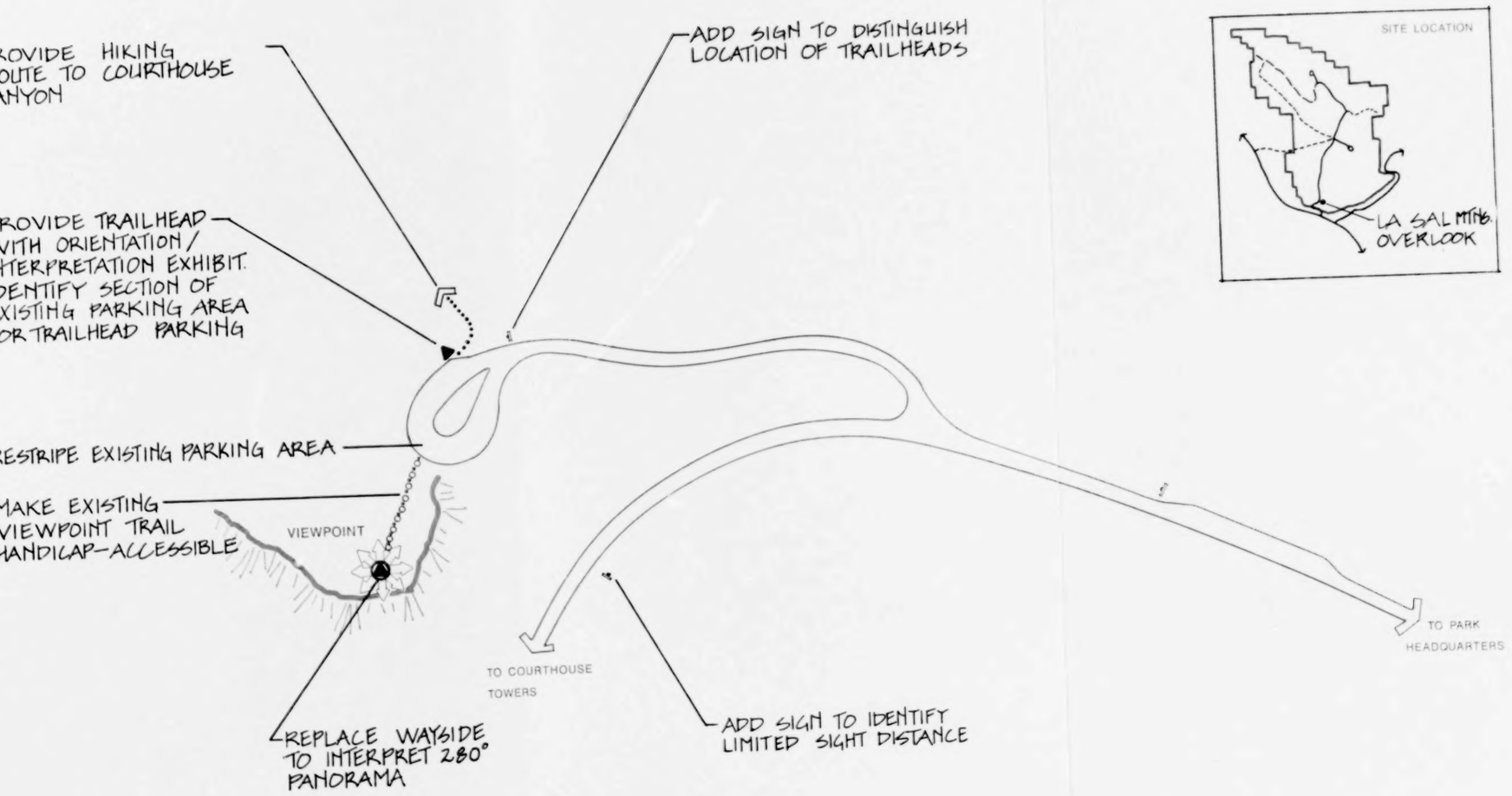

SITE PLAN

LA SAL MOUNTAINS OVERLOOK
ARCHES NATIONAL PARK
UNITED STATES DEPARTMENT
OF THE INTERIOR
NATIONAL PARK SERVICE

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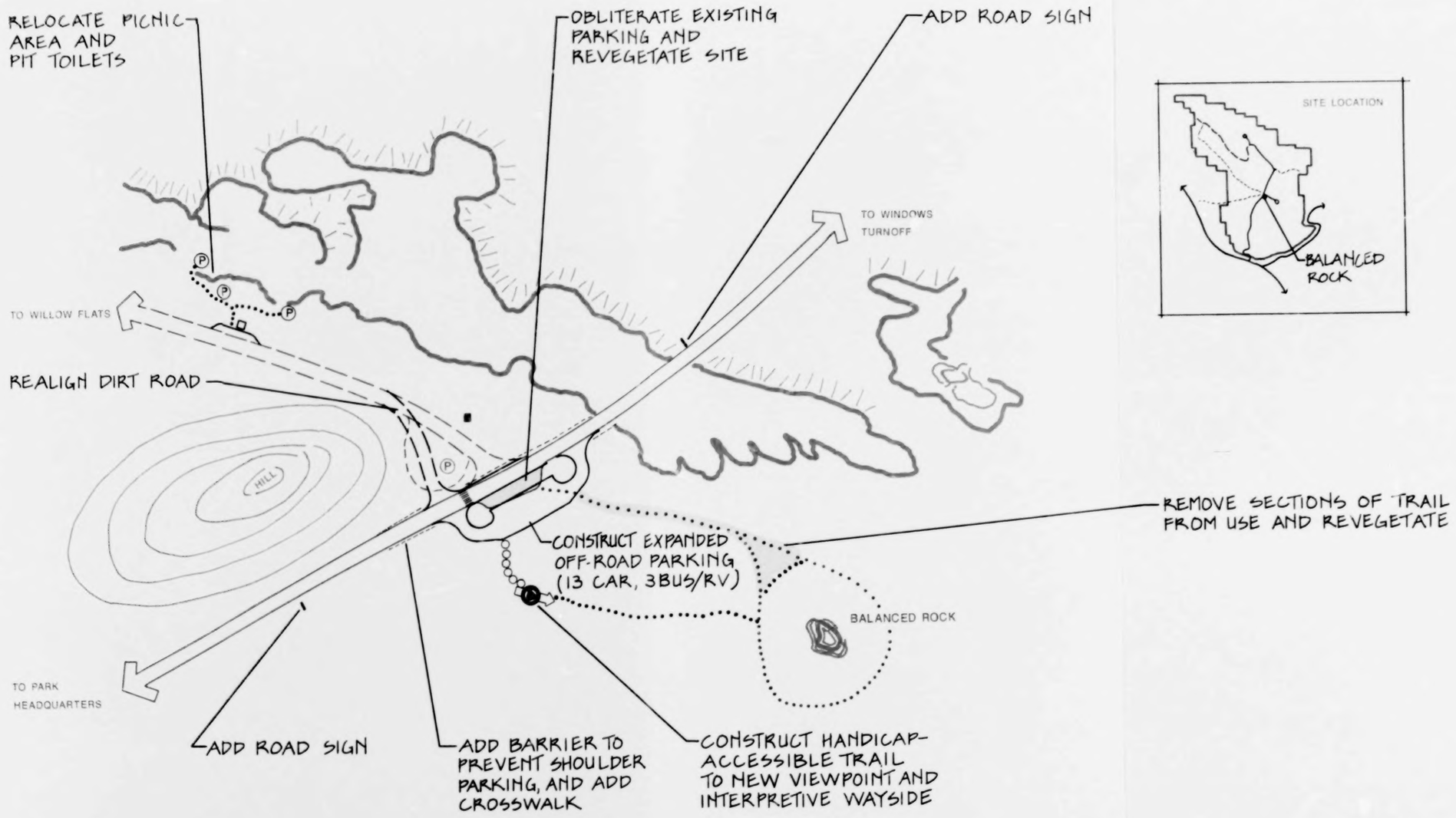
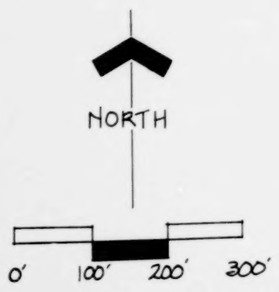

RELOCATE PICNIC AREA AND PIT TOILETS
OBLITERATE EXISTING PARKING AND REVEGETATE SITE
ADD ROAD SIGN
TO WINDOWS TURNOFF
TO WILLOW FLATS
REALIGN DIRT ROAD
HILL
CONSTRUCT EXPANDED OFF-ROAD PARKING (13 CAR, 3BUS/RV)
REMOVE SECTIONS OF TRAIL FROM USE AND REVEGETATE
BALANCED ROCK
TO PARK HEADQUARTERS
ADD ROAD SIGN
ADD BARRIER TO PREVENT SHOULDER PARKING, AND ADD CROSSWALK
CONSTRUCT HANDICAP-ACCESSIBLE TRAIL TO NEW VIEWPOINT AND INTERPRETIVE WAYSIDE

LEGEND

EXISTING	PROPOSED	
	○○○○○○○○○○	HANDICAP-ACCESSIBLE TRAIL
.....	.....	HIKING TRAIL
Ⓟ	Ⓟ	PICNIC AREA
■	□	TOILET
	▲	REVEGETATION AREA
	-----	INTERPRETIVE WAYSIDE
		ROAD SHOULDER PARKING BARRIER



SITE PLAN

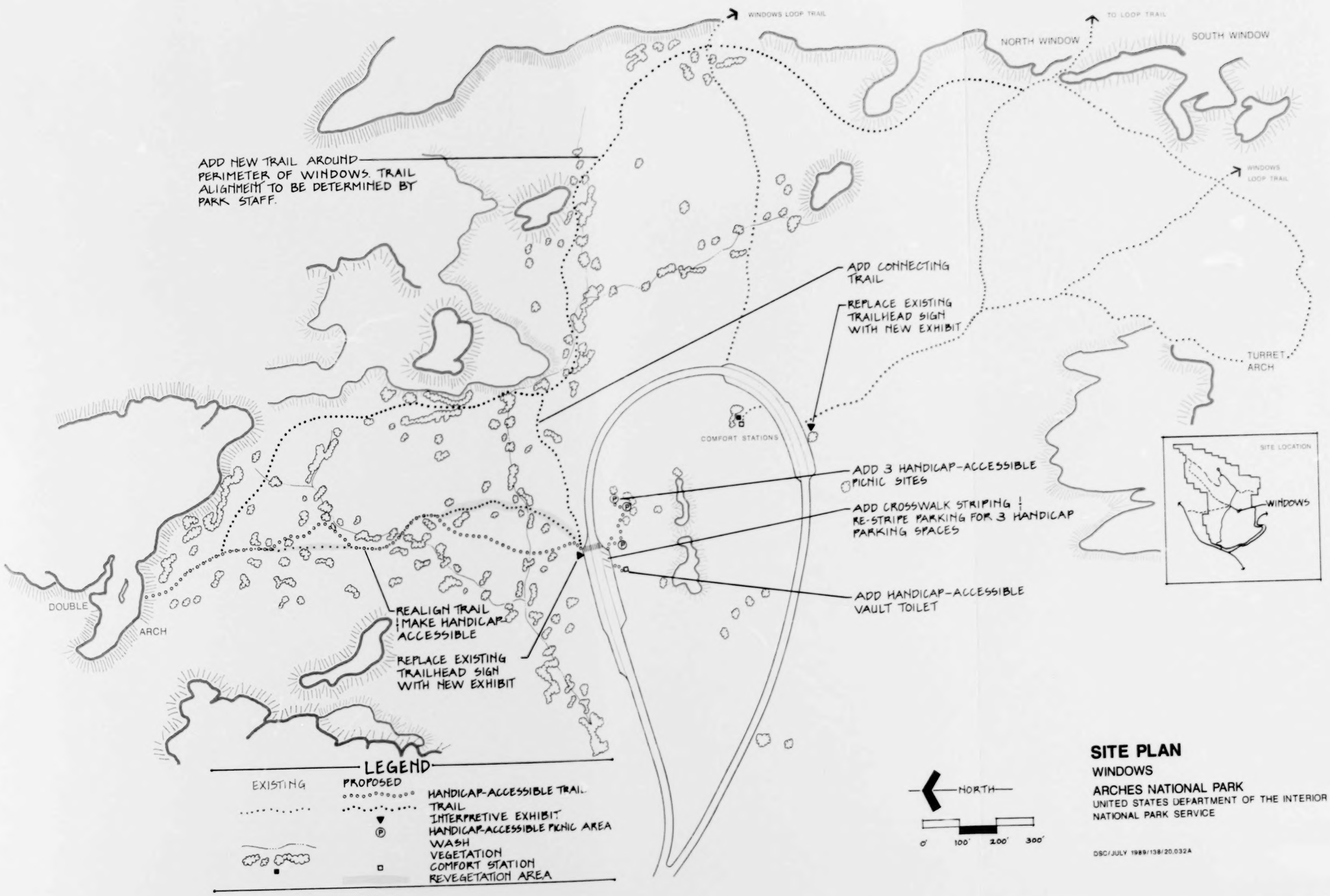
BALANCED ROCK

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,033

best copy available



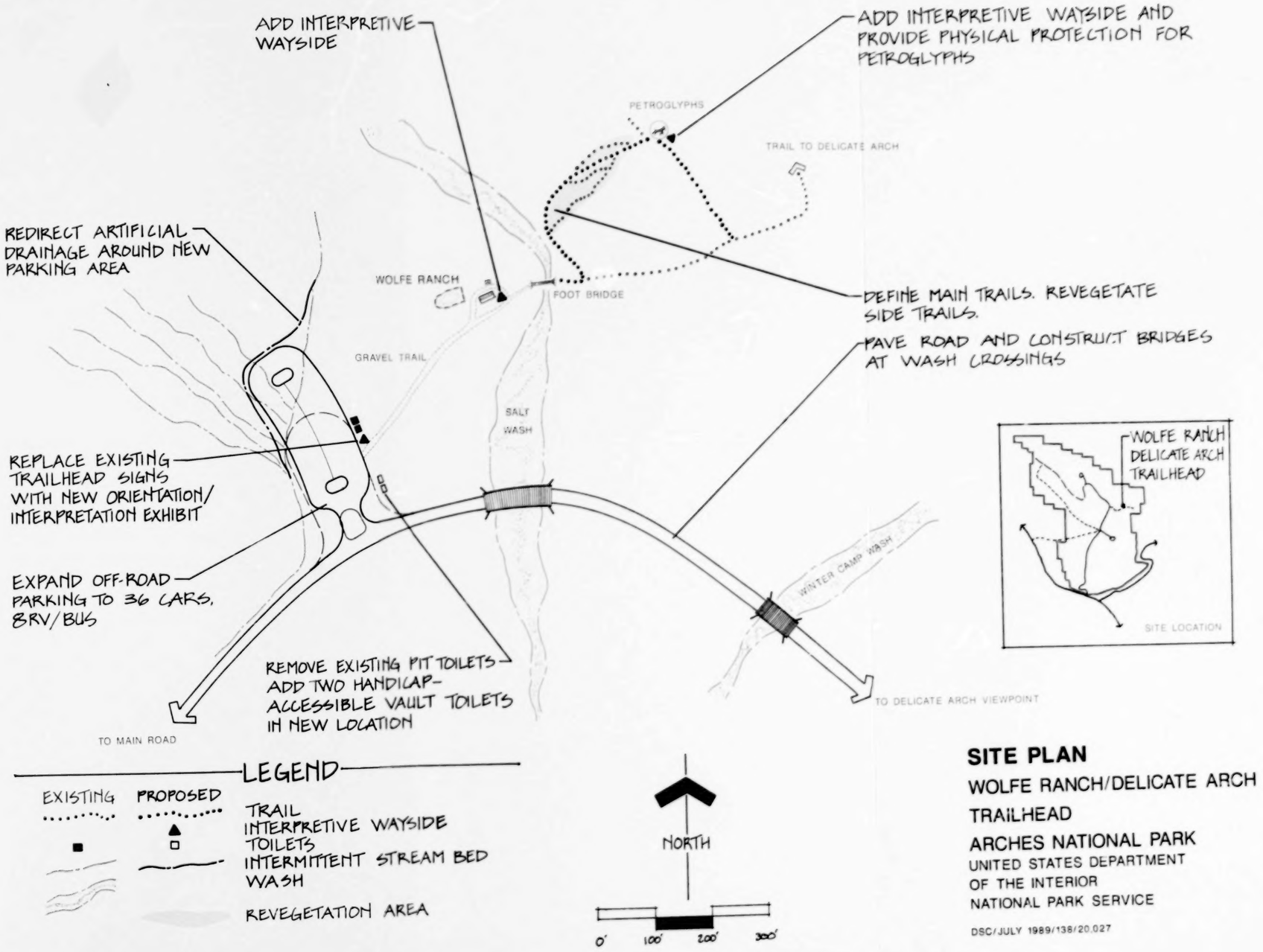
SITE PLAN

WINDOWS

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,032A



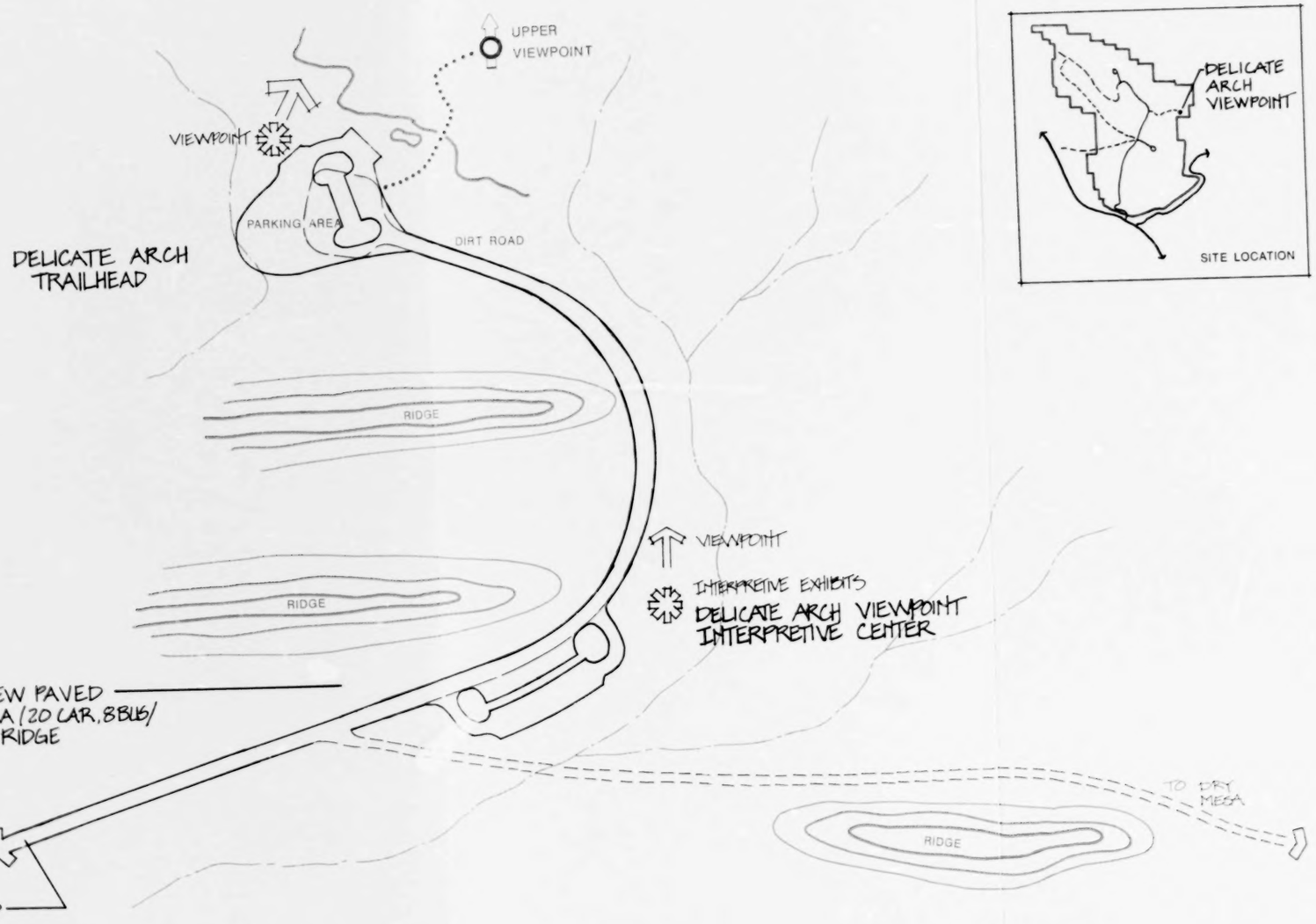
SITE PLAN

WOLFE RANCH/DELICATE ARCH TRAILHEAD

ARCHES NATIONAL PARK

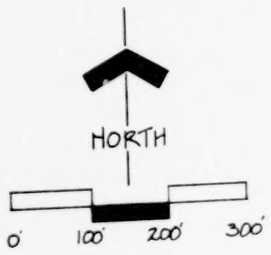
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,027



LEGEND

EXISTING	PROPOSED	
=======	=======	FOUR-WHEEL-DRIVE ROAD
.....	.....	TRAIL
		INTERMITTENT STREAM



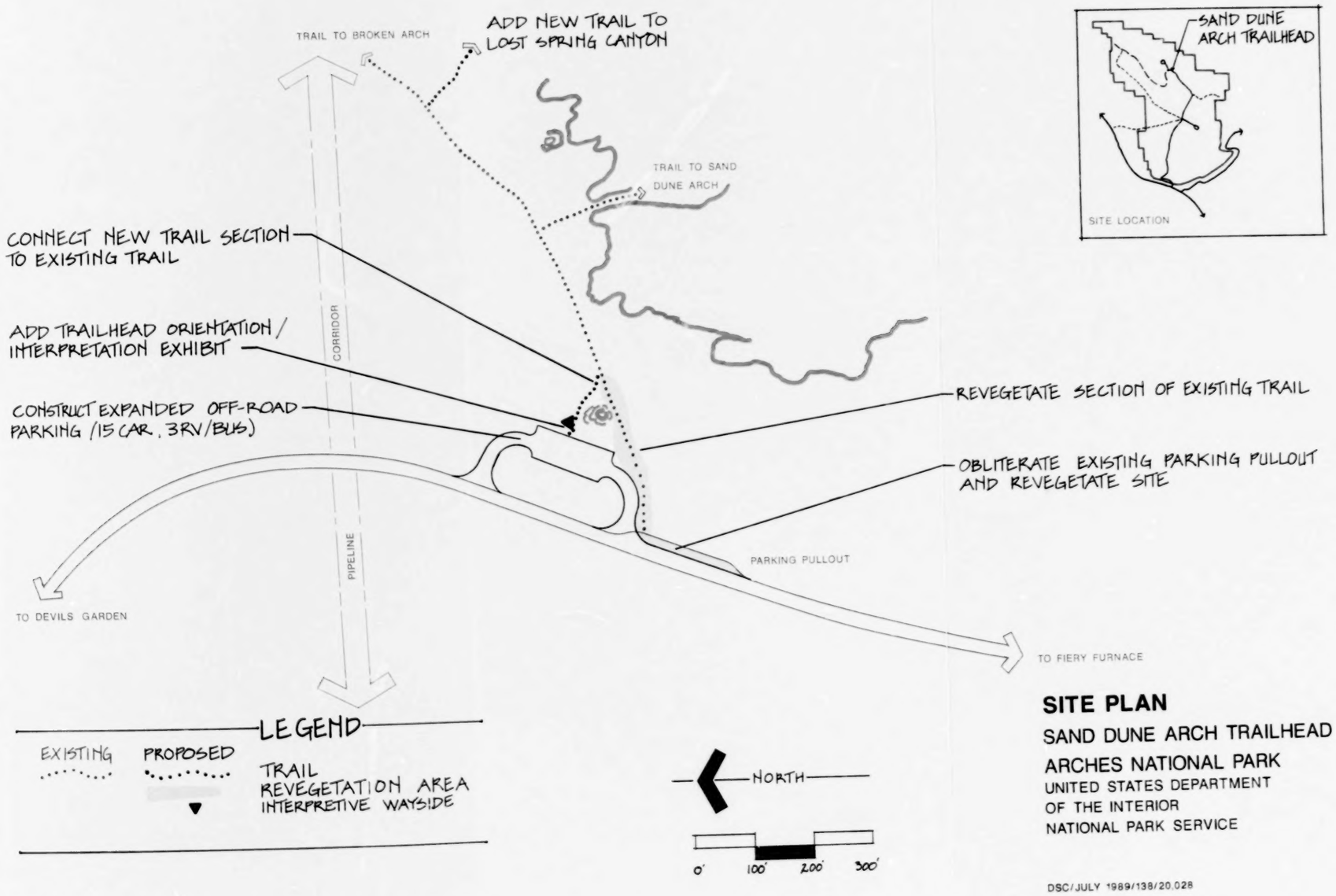
SITE PLAN

DELICATE ARCH VIEWPOINT

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,030A



SITE PLAN

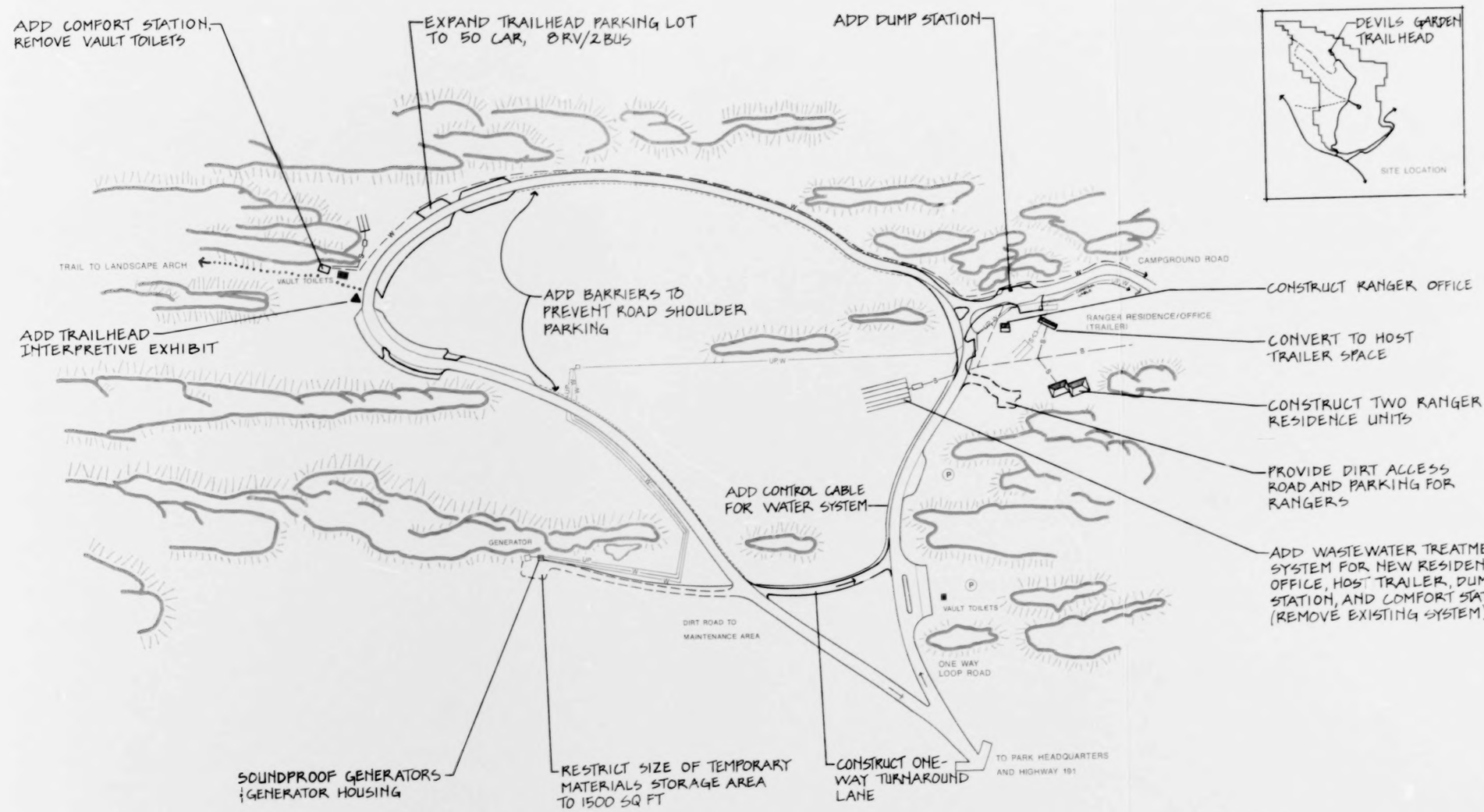
SAND DUNE ARCH TRAILHEAD

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT
OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,028

best copy available



SITE PLAN

DEVILS GARDEN TRAILHEAD AND LOOP ROAD

ARCHES NATIONAL PARK

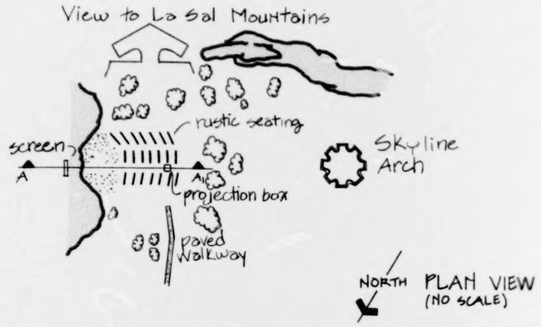
UNITED STATES DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

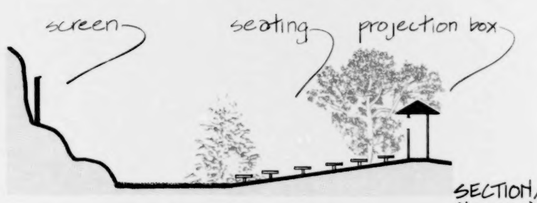
DSC/JULY 1989/138/20,034

AMPHITHEATER CONCEPT SKETCHES

EXISTING

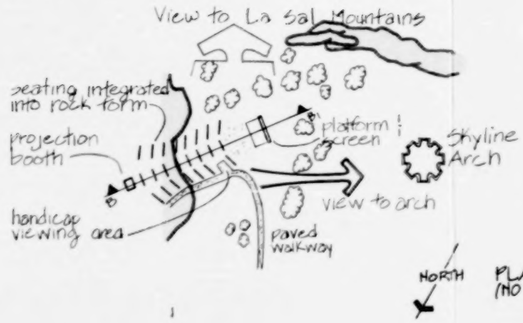


PLAN VIEW (NO SCALE)

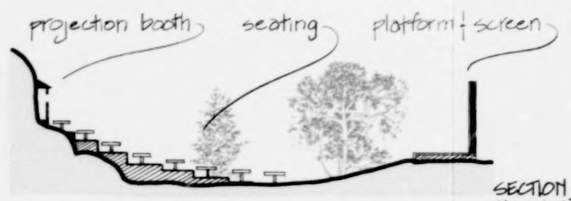


SECTION A-A1 (NO SCALE)

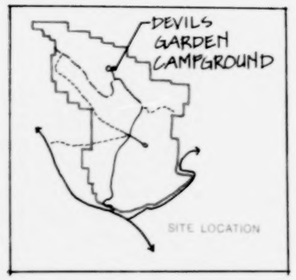
PROPOSED

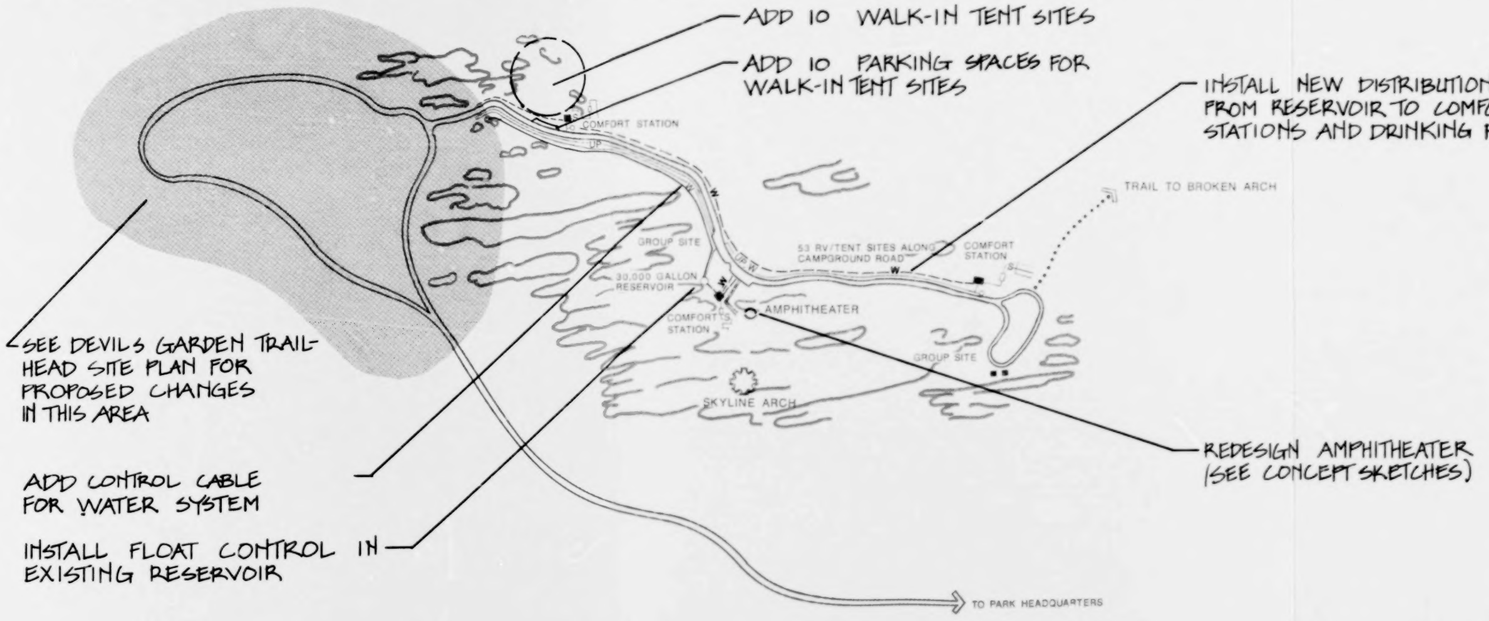


PLAN VIEW (NO SCALE)



SECTION B-B1 (NO SCALE)




ADD 10 WALK-IN TENT SITES
ADD 10 PARKING SPACES FOR WALK-IN TENT SITES
INSTALL NEW DISTRIBUTION LINES FROM RESERVOIR TO COMFORT STATIONS AND DRINKING FOUNTAINS
TRAIL TO BROKEN ARCH
COMFORT STATION
GROUP SITE
53 RV/TENT SITES ALONG CAMPGROUND ROAD
COMFORT STATION
30,000 GALLON RESERVOIR
COMFORT STATION
AMPHITHEATER
GROUP SITE
SKYLINE ARCH
SEE DEVILS GARDEN TRAIL-HEAD SITE PLAN FOR PROPOSED CHANGES IN THIS AREA
ADD CONTROL CABLE FOR WATER SYSTEM
INSTALL FLOAT CONTROL IN EXISTING RESERVOIR
REDESIGN AMPHITHEATER (SEE CONCEPT SKETCHES)
TO PARK HEADQUARTERS

LEGEND

EXISTING	PROPOSED	
•••••••••		TRAIL
■		VAULT TOILETS
——W——	---W---	WATER LINE
——UP——		UNDERGROUND POWER LINE
——S——		SEWAGE LINE

NORTH

0' 300' 600' 900'

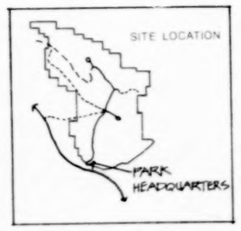
SITE PLAN

DEVILS GARDEN CAMPGROUND

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,035



LEGEND

POSSIBLE MAXIMUM FLOOD
500-YEAR FLOOD FREQUENCY LEVEL
100-YEAR FLOOD FREQUENCY LEVEL

NOTE: AREA SUBJECT TO FLASH FLOODS, TIME-TO-PEAK IS LESS THAN 0.7 HOUR FOR POSSIBLE MAXIMUM FLOOD

SOURCE: NATIONAL PARK SERVICE, WATER RESOURCES DIVISION, FT. COLLINS, COLORADO

NORTH

0' 100' 200' 300'

EXISTING FLOOD PLAIN

PARK HEADQUARTERS

ARCHES NATIONAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1989/138/20,037